THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXV. No. 609.] LONDON, JANUARY 12, 1875. [27th Year.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubitt Town. Large stocks kept.
Address G. H. Ramsay, Newcastle-on-Tyne.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
FOUR PRIZE MEDALS.
WORKS: BRIXHAM, TORBAY.
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
London Office, 21, Great Winchester Street, E.C.

PROUD'S
SPECIALITIES IN WOOD
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
BROOKFIELD WORKS,
103, **ICKNIELD STREET EAST,**
BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
Quay Side, Newcastle-on-Tyne.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL AND CO.,
THE OLD TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
Warehouses:
69, UPPER THAMES STREET;
COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE,
} LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
Lists may be obtained on application to
69, UPPER THAMES STREET, LONDON.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM.
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
C[illegible] & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Ma[illegible], Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Ro[illegible] Girders, and Bridges, and General Smith's Work.
London Agent—W. G. DAVIS, 2, Brabant Court, Philpot Lane, E.C.

SCOTTISH CANNEL COAL.
J. & W. ROMANS,
GAS ENGINEERS AND COAL FACTORS,
CONTRACT FOR SUPPLYING ANY QUANTITY
OF
GAS, HOUSE, AND STEAM COAL,
AND
CANNEL;
Also for every sort of
GAS APPARATUS AND FIRE GOODS.
For Prices, &c., apply to the Offices,
30, ST. ANDREW SQUARE, EDINBURGH.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

GEORGE GLOVER & CO.,
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW: AND 15, MARKET STREET, MANCHESTER.

G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

WAREHOUSES:

LONDON: 157, UPPER THAMES STREET, E.C.

LIVERPOOL: No. 63, Paradise Street. | PARIS: No. 38, Rue du Chateau d'Eau.

MANCHESTER: Barlow's Croft, Chapel Street, Salford. | LILLE: No. 38, Rue Grande Chaussee.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.

SAVES COAL, RETORTS, FUEL, LABOUR, TIME, SPACE, AND CAPITAL.

PREVENTS STOPPAGE OF ASCENSION-PIPES, DEPOSITION OF CARBON IN RETORTS, THICKENING OF TAR IN HYDRAULIC MAIN.

GIVES MORE GAS PER TON OF COAL, WITH HIGHER ILLUMINATING POWER, SATISFACTION, AND PROFIT TO SHAREHOLDERS AND MANAGERS.

IS STRONG, SIMPLE, EASILY FIXED AND WORKED, AND THOROUGHLY EFFICIENT AT ALL TIMES.

TESTIMONIAL.

Gas-Works, Guildford, Sept. 15, 1874.

GENTLEMEN,—The five retorts fitted with your Patent Moveable Seal for Dip-Pipes, on June 30, have been in constant use since that date, and have worked in a most satisfactory manner.

These Retorts are still quite clean and free from carbon, whilst others not so fitted, after being at work eight weeks, required scurfing, having a deposit of carbon 2 inches in thickness on the inside.

I also find a slight increase in the yield of gas per ton of coal carbonized, although your Patent Seals are fitted to but one-fifth of the Retorts now at work.

As your statements respecting your apparatus are fully confirmed by the results obtained in practical werking, I should wish you at once to fix one to each of the ovens at these works, that I may obtain all possible advantage during the coming winter.

Yours truly,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street, E.C. Jos. SHAW, Manager.

MODELS MAY BE SEEN, AND INFORMATION OBTAINED, AT THE OFFICES, 28. GRACECHURCH STREET.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

HENRY HOWARD & CO.,

COOMBS WOOD PATENT TUBE-WORKS,

OLD HILL, near DUDLEY,

MANUFACTURERS OF

HOWARD'S PATENT IMPROVED WROUGHT-IRON TUBES,

FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON STREET, OLDHAM.

HENRY THOMAS, Managing Director.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast Iron and Tin Cases,

OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

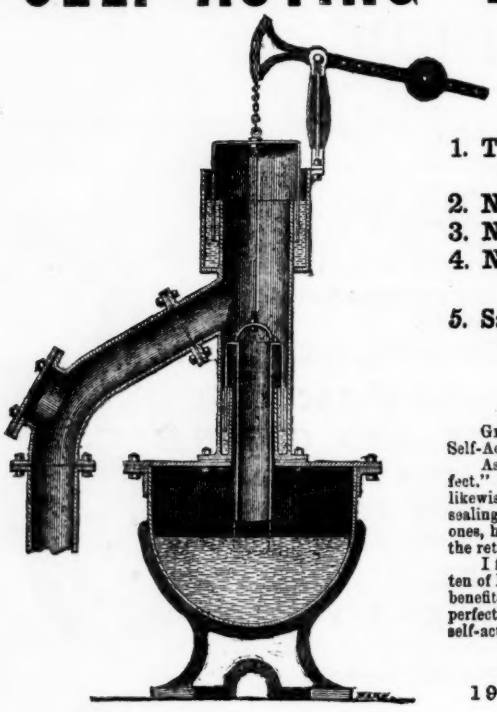
STATION METERS AND GOVERNORS,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

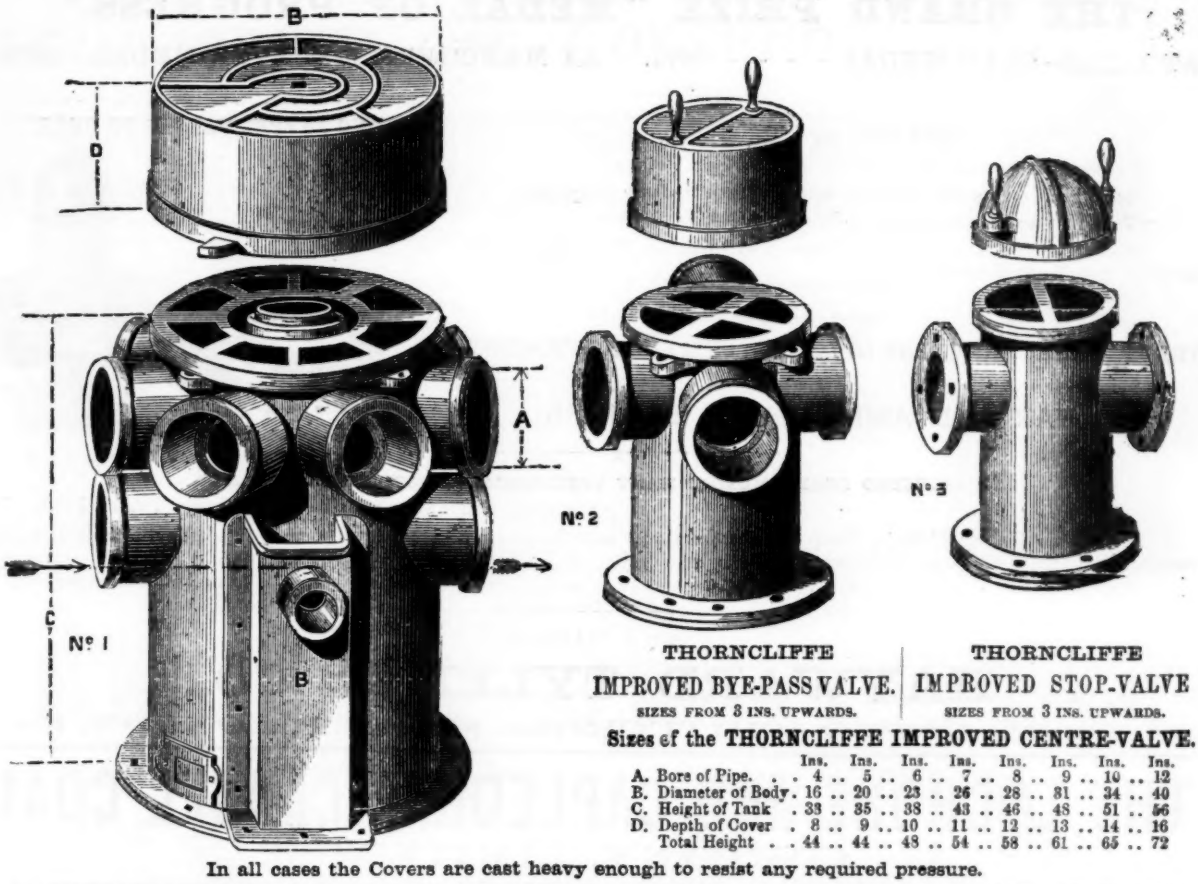
For terms of use and cost, apply to the Patentees,

19, GREAT GEORGE STREET, WESTMINSTER.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

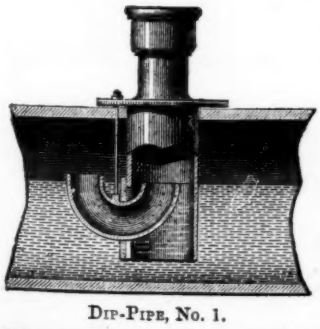
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



DIP-PIPE, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

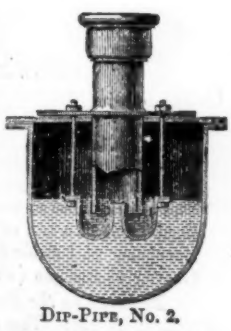
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



DIP-PIPE, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

THE

PATENT "UNIVERSAL" STEAM PUMP

WAS AWARDED, AT THE

VIENNA EXHIBITION, 1873,

THE GRAND PRIZE "MEDAL OF PROGRESS."

AT LILLE—GOLD MEDAL - - - - 1874. AT MANCHESTER—SILVER MEDAL - 1874.

OPINIONS OF THE PRESS.

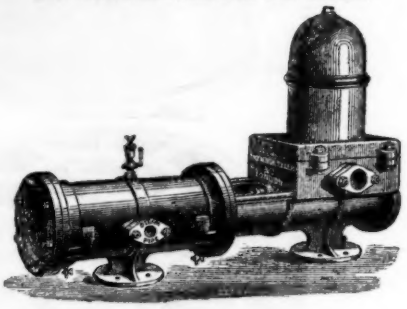
"The simplest machine of its kind."—*Engineering.*

"Remarkable for its simplicity and ease of action."—*Daily Telegraph.*

"None that we have noticed work so quietly."—*The Engineer.*

"Nothing invented in hydraulic steam power half so cheap and effectual."—*Griffith's Iron Trade Exchange.*

NO TAPPET VALVES OR GEAR.



IN USE IN SOME OF

THE PRINCIPAL GAS-WORKS IN LONDON, SHEFFIELD, PENISTONE, &c.,

FOR

TAR AND AMMONIACAL LIQUORS.

ONE SELECTED FROM AMONGST MANY TESTIMONIALS RECEIVED BY H. T. & CO.:—

"*Ardwick Bridge Chemical Works, Manchester, Oct.* 28, 1872.

"Sir,—The 'Universal' Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily,

"Yours truly,

(Signed) "PETER HART, *Manager.*"

SOLE MAKERS,

HAYWARD TYLER & CO.,

84 and 85, UPPER WHITECROSS STREET, LONDON, E.C.

THE LOCHORE AND CAPLEDRAE CANNEL COAL

COMPANY, LIMITED.

Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91 "	34·83 "
Value of 1 cubic foot of gas in grains of sperm	780 "	836 "
Equivalent of a ton of coal in pounds of sperm candles	1,459 "	1,404 "
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596 "	594 "

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	11,830 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·53 "	33·09 "
Value of 1 cubic foot of gas in grains of sperm	877 "	794 "
Equivalent of a ton of coal in pounds of sperm candles	1,482 "	1,264 "
Durability of 1 cubic foot of gas by 5-inch flame	75 minutes.	67 minutes.
Gravity of the gas (air = 1000)	610 "	597 "

Remarks on the Sample of Capledrae Waverley.—This is a Gas Coal of remarkably fine quality, giving nearly 12,000 cubic feet of 36-candle gas. The coke, although not altogether valueless, is of inferior quality.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

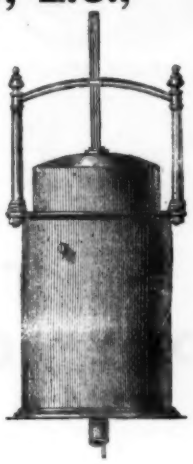
19, MAITLAND STREET, EDINBURGH.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

HUNT'S PATENT
EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

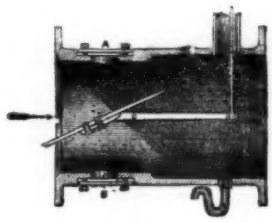
The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

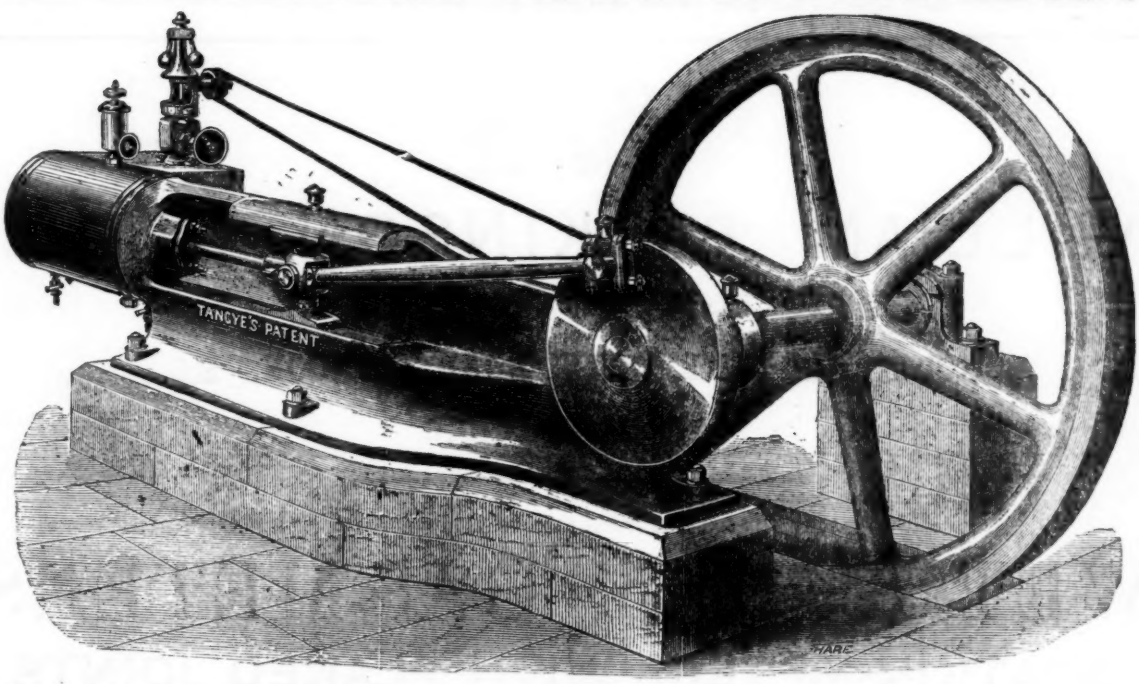
These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Company—two 36 in. at Blackfriars.
" " a 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Company—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "

The Exeter Gas-Works—a 24 in.
The Abergavenny Gas-Works—a 10 in.
The Birmingham Gaslight Company—an 8 in.
The Monmouth Gas-Works—an 8 in.
The Devonport Gas-Works—an 8 in.
The Cannes Gas-Works (France)—an 8 in.
The Mentone Gas-Works (France)—an 8 in.
The Rochdale Gas-Works—a 4 in.
The Imperial Gas Company, a 12 in at Great Cambridge Street.



TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE
STEAM-ENGINES.



In this Engine the working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact. The bed-plate, front-cylinder cover, cross-head guides, and plummer-block for crank-shaft bearing, are all cast in one piece, the cylinder with its valve-chest being bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

Number	B	C	D	E	G	H	J	K	M
Nominal Horse Power .	2	3	4	6	8	10	14	18	25
Price of Engine . . .	£32	£38 15	£46	£70	£90	£115	£145	£185	£200
Feed Pump, extra . .	£3	£3 15	£4	£5 10	£6	£7 10	£8	£10	£15
Diam. of Steam Cylinder	4 in.	5 in.	6 in.	8 in.	9 in.	10 in.	12 in.	14 in.	16 in.
Length of Stroke . .	8 "	10 "	12 "	16 "	18 "	20 "	24 "	28 "	28 "

These Engines are adopted in Gas-Works at Haggerston (Independent Gas Company), Nine Elms (London Gas Company), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

CONTENTS.

	Page
Circular to Gas Companies:—	
Proposed Increase of Capital for the Chartered Company	45
The Prospects of Amalgamation	45
The Birmingham Corporation and Neighbouring Local Boards	45
The Bilston Gas Company	46
The Corporation of Pontefract and the Gas Company	46
The Explosion at Durham	46
Proposed Purchase of the Gas Company at Longton	46
Gas Affairs at Tunbridge Wells	46
Gas Affairs at Seaham Harbour	46
Complaints at Tunstall	46
The Salford Town Council and the Barton Local Board	46
Water and Sanitary Notes:—	
Cessation of Typhoid Fever at Over Darwen	46
Typhoid Fever at Oxford	46
Penny Sanitary Lectures at Birmingham	46
Proposed Purchase of the Leicester Water-Works	46
Leading Article:—	
A Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas	47
Correspondence:—	
Efficient Valves for Purifiers	48
Scrubbers	48
Specific Gravity Apparatus	49
The Worcester Gas Company	49
Legal Intelligence:—	
Worship Street Police Court—Summons for Cutting off Gas	49
Greenwich Police Court—Explosion in a Sewer at Greenwich	49
Lambeth Police Court—Extinguishing Street-Lamps	49
Miscellaneous News:—	
Darlington (Corporation) Gas Supply	46
Bath Gas Supply	46
Metropolis Gas Supply	50
Metropolis Water Supply	50
Meeting of the Bilston Gas Company	50
Rochdale (Corporation) Gas-Works	51
Quality of Gas at Aberdeen	51
American Gaslight Association	52
Tunbridge Wells Gas Supply	53
Birmingham (Corporation) Gas Bill	54
Longton Gas Supply	54
Manchester (Corporation) Gas Supply	55
Gas Explosion at Durham	55
Abandonment of the Proposed Sale of the Winchester Water-Works to the Corporation	56
New American "Gas Saver"	56
Honour to Mr. R. A. Gray	56
Leicester Water-Works	57
The Law of the Diffusion of Gases	58
Buralem Gas Supply	58
Iron and Coal Trades of Sheffield, South Yorkshire, and North Derbyshire	59
Iron and Coal Trades of South Staffordshire and East Worcestershire	59
Iron and Coal Trades of Lancashire	59
Coal and General Trade of the North	59
Natural Gas Supply at Chatillon (Haute Savoie), France	59
Gas Explosion at Stirling	59
Gas Explosion at Middlesbrough	59
Neath Water Company	59
Interruption by Frost of Gas Supply	59
Barton Local Board and the Corporation of Salford	59
Explosion of a Kitchen Boiler at Salford	60
Stafford Water Supply	60
Register of New Patents:—	
Applications for Letters Patent	60
Grants of Provisional Protection	60
Invention protected for Six Months	60
Notices to Proceed	60
Patents which have passed the Great Seal	60
Patents which have become void	61

NOTICE TO SUBSCRIBERS.

Subscribers who desire to avail themselves of the reduction in the subscription to the JOURNAL by paying in advance for the year 1875, are reminded that this can only be done during January.

SUBSCRIPTIONS.

Yearly	21s. in advance.
"	25s. on credit.
Half-Yearly	10s. 6d. in advance.
"	12s. 6d. on credit.

Vol. XXIV. (second half of 1874) will shortly be ready, bound in cloth, gilt letters, price 18s. Cloth cases for binding may be obtained on order from any bookseller, or from the Publisher.

All communications for the Editor, remittances for subscriptions, and orders for advertisements should be addressed to the Publisher, William B. King, 11, Bolt Court, Fleet Street, London, E.C.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 12, 1875.

Circular to Gas Companies.

AN extraordinary meeting of the Chartered Company is called for the 22nd inst., to obtain the approval of the shareholders for the Bill now promoted by the directors, which we lately noticed, and also to authorize the issue of new shares to the amount of half a million of pounds. Another object is to obtain the sanction of the shareholders for the sale of a further portion of the company's property. The issue of this new capital will raise the amount employed by the company to considerably more than four millions, a total which, to some, will look alarming. No doubt the money is urgently wanted for the large extensions and alterations now in progress at Beckton, and for further additions to the Kensal Green works. As regards Beckton, indeed, it seems likely that even still larger additions will soon be required. A new town in the immediate vicinity of the works is projected, under circumstances which promise success to the enterprise, and a large demand for gas is certain to result. In the western district also, the multiplication of houses is very rapid, and, altogether, it is clear that the increased demand for gas in the company's district will, in the course of a very short time, necessitate the expenditure of all the capital they have now power to raise. There is no such thing as "finality" for the Chartered Company. They must go on, and their capital must, in the future, be added to in a larger ratio than in past times.

The proposed addition of half a million is sure to attract the attention of the cavillers, who affect to believe that all new capital issued by gas companies is simply meant to produce dividends, and is only remotely, and in small part, designed to increase the productive capacity of the undertakings. We shall presently have to listen to a great deal about extravagance of management, and all that, from parties like the Metropolitan Board of Works, who, if they took over all the gas undertakings to-morrow, would find themselves obliged to add four or five millions to the capital account within a very few years. This is a point which may have escaped the attention of the advocates of the purchase of the companies, but it is one which they would soon find to be of the greatest importance. If the metropolis continues to grow, even at the present somewhat diminished rate, the capital employed in the manufacture and distribution of gas must be doubled in the next eight or ten years.

The question, however, which is sure to be debated now is, How can the Chartered Company raise the money most economically. The cavillers we alluded to will, probably, remember Mr. Farrer's letter, and call to mind that the unexhausted borrowing powers of the company are still considerable. They must, however, recollect that the last attempt of the company to borrow money at a low rate of interest was by no means successful, and any one who watches the money market just now will see that the chances of a loan at a low rate are by no means promising. Only last week we saw one of the most flourishing of the Australian colonies trying to raise a 4 per cent. loan at 90; and of £600,000 asked for, only £38,000 was subscribed, at and above the price fixed. What prospect, then, has a gas company of raising money at much less than 6 per cent.? We have grave doubts whether the Metropolitan Board will ever again raise money at the rate at which they have got it before.

The notice that the directors propose to sell a further portion of the company's property will also suggest to the cavillers that a large amount of capital is now lying idle and unproductive. There are the Brick Lane and Curtain Road stations—we rather think absolutely unused. The Blackfriars works are very little utilized, and the Horseferry Road works and Vincent Street storeage station can hardly both be required. We are strongly of opinion that central storeage works are absolutely necessary, and for them the company must provide; but with a reservation for these, it is evident that the company have several sites now idle, the value of which, and the old materials upon them, had best be realized as soon as possible. In that way some of the indignation which local orators will be sure to vent will lose much of its force.

As regards the prospects of amalgamation, we have nothing further to report, and probably but little will be effected in that direction until the companies have felt their position in Parliament. If any directly hostile spirit be exhibited, it would, we have no doubt, be met at once by a coalition, which would give enormous strength to the opposition. We do not believe, however, that the present Parliament will deal in any but the fairest way with the gas companies. Conservative, and with a preponderance of commercial representatives, we expect to see the old lines rigorously followed by the House of Commons, while in the Lords there is little to fear in the way of opposition, except it may be some from Lord Cardwell, who is now free to ventilate his peculiar opinions on the metropolitan gas supply.

The Birmingham Corporation Gas Bill promises to give rise to the most interesting contest on record. We say "contest," but, practically, some six or seven are involved. The circumstances are peculiar, and we believe unprecedented. The limits of the two Birmingham Gas Companies, and most notably that of the Birmingham and Staffordshire Company, include the districts of several independent local authorities. So long as these are supplied by the company, the ratepayers are content to pay the price charged, and thus contribute to the profits of the shareholders. But when the Corporation of Birmingham propose to take over the undertakings, and apply the profits to the exclusive benefit of the borough of Birmingham, the smaller authorities consider themselves aggrieved. We presume they will one and all appear in opposition, but in most cases only to obtain protective clauses. But one or two, like Oldbury, seem to be in earnest in their desire to have gas-works of their own. They think they could make gas cheaper than the Corporation of Birmingham, and get a good profit for the advantage of their own district. The Mayor of Birmingham cannot be astonished at the proceedings going on around. He has proclaimed his opinion that gas and water works should be in the hands of the local authorities, in order that a profit may be made for the public benefit, and all the neighbour-

ing Boards agree with him. He ought to feel flattered at the general concurrence of opinion; but it will seriously derange his calculations if, in the end, the undertakings are cut up into sections.

The Bilston Gas Company may be congratulated on having to take only £55 from their reserve-fund to make up their usual dividend. Like all neighbouring gas companies, they have suffered from the high price of coal and the depreciated value of coke in consequence of Staffordshire strikes; but, under the circumstances, they have done very well.

The Corporation of Pontefract are promoting an extension and improvement Bill, one object of which is to acquire and purchase the gas undertaking by agreement. So far so good; but there is in the Bill a clause to which the gas company will give all needful attention. In an old improvement Act, there is, it seems, a usual clause authorizing the Corporation to make contracts for the lighting of the streets. The present Bill proposes to extend this enactment, so as to give the Corporation power to make contracts for 20 years. The object is apparent enough, and is, indeed, distinctly avowed. It is to give the Corporation authority to grant a concession to a rival gas company. We do not believe that Parliament will listen to a proposal of this kind, and we think the Town Council have missed their mark when they agreed to drop the purchase clauses of their Bill, and to adhere to the competition section.

The lamentable explosion at Durham conveys a useful lesson to all gas companies, and probably an expensive one to the company immediately concerned. It is that a leak of any kind should be instantly looked after, and stopped with the utmost speed. To recommend people to quit their house, and leave their windows open for a couple of days, until the matter could be looked into, was an admirable precaution; but, in this instance, unhappily, it was only partially successful. There is no great blame to be attached to the officers of the company, whose only mistake was under-estimating the magnitude of the leakage. Mains will break in unsettled soil, and in any future accident we have no doubt that the Durham Company will at any time, even on a Saturday half-holiday, have at command a sufficient staff of men to search for, and stop, a leak.

The Town Council of Longton are desirous to purchase the gas undertaking of the district, and propose to negotiate with the directors of the company. There are no complaints against the company, who have not raised the price of gas while high prices for coal ruled; the council only appear to be smitten with the general rage for the acquisition of gas undertakings.

The Improvement Commissioners of Tunbridge Wells have expressed "dissent to the Bill" now promoted by the gas company, and probably will call a ratepayers meeting to obtain permission to oppose the measure. Peculiar circumstances rendered the commissioners successful in their opposition last year, but now the conditions are altered. The site fixed on for the new works is entirely unobjectionable; at all events, to the authorities and the aristocracy of the neighbourhood. But it is likely that the commissioners will oppose the extension of the limits of the company, on the ground that the necessary increase of capital will necessitate an increase in the price of gas in Tunbridge Wells. The complaints of the gas, made at the meeting of the commissioners will, of course, receive the attention of the company. To us, we must say, they look exaggerated, and even untruthful.

If gas could be cheap anywhere, it might be thought it would be at Seaham Harbour; but there the gas company have just issued a notice that the price for the present will be 5s. 5d., and the chairman of the company has intimated to a deputation of indignant consumers that it may soon be 6s. The reason for the present rise is explained with the utmost candour. "The increase," says the company's circular, "is owing to the additional "capital invested by the company in the new gas-works, which "were rendered necessary for the continuance of the gas supply to "the town." The townspeople are talking of burning anything rather than gas; but they will soon quiet down and pay the additional 10d., with grumbling, no doubt, but still with a satisfaction that they have not the trouble of trimming lamps and snuffing candles.

Great complaints are made of the gas supply at Tunstall, where we may imagine that the mains and service-pipes have become choked with naphthaline. These conditions will recur with every prolonged continuance of cold weather, but they may be speedily remedied, as we hope they will be at Tunstall.

The Salford Town Council are not exactly happy in their relations with the outlying districts which they supply with gas. The Barton Local Board for example, since they do not participate in the profits of the undertaking, protest, reasonably enough, we think, against differential rates, and ask to be supplied on the same terms as the borough of Salford. The Gas Committee of Salford, however, do not seem to see the reasonableness of the proposition, so the Barton Local Board will proceed with a Bill to obtain power to furnish an independent supply, and we hope they will meet with success.

Water and Sanitary Notes.

THE epidemic of typhoid fever at Over Darwen has happily ceased, and the inhabitants have had a public thanksgiving, and now the secret of the outbreak, as it is called, is revealed. A case of fever occurs in a house some distance from the town. The drainage of this house, which will contain the excreta of the patient, is carried into a field used for agricultural purposes. Through this field passes the pipe which carried the water supply to Over Darwen. In this pipe a leak is found, through which the drainage from the house, it is alleged, was freely sucked into the water-main, and of course distributed over the town. While waiting for the official report, which we hope will be illustrated with plans and drawings, showing the exact positions of the drain and the water-pipe, we shall express no opinion on the matter. It will be advisable also to have dates, showing when the first case occurred, when the man died, when the outbreak in the town commenced, and how it progressed. There is no allegation that the excreta of any but this one patient passed into the water, and it will be of some importance to account for the continuance of the epidemic some months after the man died.

Prince Leopold has had a slight attack of typhoid at Oxford, and one or two other undergraduates of the University have died of the disease. The medical officers of the Local Government Board will, of course, investigate the matter, and we shall have another lucid report, showing how excretal matter got into the Oxford water, whether by the direct access of the "cheesy "matter" from Peyer's glands, spoken of by Drs. Budd and Tyndall, which, unlike all other albumenoid matters, seems to have a miraculous power of withstanding decomposition, and which, when it is decomposed, and converted into gas or vapour, would appear to be endowed with the same poisonous properties it possessed when it was "cheesy matter." To speak seriously, however, on what is really a most serious question, we wish to see some truly scientific investigation of this most important matter. At present we see nothing of the kind. Every effort is devoted to find evidence in support of a foregone conclusion.

A very sensible movement has been commenced in Birmingham, where penny sanitary lectures have been inaugurated. The first lecture, by Dr. Hill, the medical officer of the borough, was on "Healthy Homes." The conditions necessary for health were plainly laid down. Proper ventilation of houses, good water, sound food, and good cooking; and last, but not least, the absence of dram drinking. We hope the people of Birmingham will act on the advice so cheaply administered, in which case we may expect that there will be Methuselahs in the borough before the next flood.

A majority of the Corporation of Leicester are very desirous of acquiring the undertaking of the Leicester Water-Works Company, in which they already possess a considerable interest, and a committee has been appointed to confer with the directors. We believe that the townspeople of Leicester are greatly indebted to the water company, but, no doubt, the property will be parted with if proper terms be offered. The Corporation, however, must not expect to make an immediate profit on the transaction. As we have said, over and over again, Corporation water-works are not, as a rule, profitable, and they ought not to be. As regards consumers, we question whether they, if the transfer take place, will find themselves pecuniarily better off. The Town Council will find a ready excuse for stopping the use of well water, which, so far as we know, is no worse in Leicester than elsewhere.

DARLINGTON (CORPORATION) GAS SUPPLY.—At the monthly meeting of the Darlington Town Council on Thursday last, Mr. Dresser complained of the inefficiency of the gas department and the inattention paid in certain cases. Alderman Kitching hoped, as they were about to have a new gas manager, that there would be an improvement. It was stated that the reason why so large a part of the town had been in darkness was owing to some breakage at the works. It was also stated that Mr. W. Smith, of Banbridge, had been appointed gas manager, in the room of Mr. Emmerson, resigned.

BATH GAS SUPPLY.—At the meeting of the Bath Town Council on the 6th inst.—Alderman Murch presiding—a memorial signed by 32 of the principal tradesmen of the city was presented and read, in which complaint was made of the bad quality of the gas supplied by the gas company, and the offensive smell it emited. The memorialists urged the council to take steps to put a stop to the nuisance, and to see that the new bill the company have prepared shall protect the public from such gross and culpable negligence. Mr. Duck moved that the memorial be referred to the Gas Bill Committee, and stated his experience of the gas nuisance, which he said had compelled persons to leave the theatre, customers to leave shops, and to create apprehensions in the minds of those who used it for cooking purposes. In the event of there being no improvement, he threatened to bring an action against the company. Mr. Heywood seconded the motion. Mr. Gibbs stated that the point had been considered by the committee appointed by the council with reference to the new bill of the gas company, and they thought a provision should be inserted to guarantee both quality and quantity. Mr. B. Bartrum, a director of the company, explained that the *employés* of the company were under the same sort of discipline as soldiers, and that owing to the great demand for gas this Christmas the company had not been able properly to purify it. The motion was agreed to.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XLVI.

The Purification of Gas.—Condensation.

We have now to consider what happens in the several parts of apparatus placed between the retort and the gasholder, and designed for the removal first of tar, oils, and naphthaline, and aqueous vapour, and afterwards for the abstraction of ammonia, carbonic acid, sulphuretted hydrogen, bisulphide of carbon, and the small amount of cyanogen compounds always present in raw gas. The first of these are removed by a natural process, which we call condensation.

It would appear an extraordinary—if it were not an easily explicable—fact that the gases and vapours generated in a retort heated to, say, 1800° Fahr., if allowed free egress, are found to have the temperature of only 120° to 130° (Clegg). The cause of this low temperature is the great absorption of heat which takes place when bodies assume an aëriform condition. A reference to the table (vol. xxiv., p. 759) will show that the gases and vapours are thus at a temperature below the boiling points of many of the ingredient bodies; that is, below the point of heat at which they will be permanently retained in a state of vapour. Thus condensation commences at a very early stage in the operations, and often shows itself in a very disagreeable way, in the form of stopped ascension-pipes. It is in these that we find the first deposition of tarry matter, which there undergoes distillation, by which the more volatile ingredients are driven forward, leaving a mass of pitch sometimes partly carbonized, which obstructs the pipe.

Purification to the extent of removing some part of the tarry matter with, it may be, some addition to the volume of gas is effected by contrivances whereby the crude gas is made to traverse some material, coke or an iron grating (Malam and Vincent's patent), heated to redness, and placed between the retort proper and the ascension-pipe. Much tar is no doubt removed thereby, and it may be, though it seems questionable, that the gas is improved, as regards both quality and quantity.

In the hydraulic main nothing but simple condensation takes place, and with regard to the whole of the condensing plant there is little more to be said. We are, it is true, somewhat in doubt as to the exact condition in which ammonia, sulphuretted hydrogen, and carbonic acid exist together in gas. In the retort they are no doubt uncombined, but as the temperature is reduced, and as condensation begins, combination to some extent ensues, and thus we have sulphide and carbonate of ammonium in the liquor of the tar-well. The amount is largely increased when the mixed gases and vapours are brought into intimate contact, as in the condenser of Audouin and Pelouze; but for this apparatus to work effectively for the removal of ammonia, sulphuretted hydrogen, and carbonic acid, the gas must have been freed as completely as possible from tarry matter by natural condensation. In any other case it is of course advisable to employ two such condensers and the spray as described in the second patent of the same inventors (*see* J. G. L., vol. xxiv., p. 445), by which, no doubt, a large amount of scrubbing space may be saved. We pass on to

The Chemistry of the Scrubber.

In the previous numbers of this Journal have been described the various mechanical contrivances employed to eliminate the impurities from crude coal gas, and attention has been more especially directed to those designed to effect the separation of ammonia. In the present chapter it is proposed, as far as possible, to avoid all mechanical details, and to deal chiefly with the chemical changes which take place, and the nature of the impurities removed, in that part of the purifying apparatus comprising the condenser, the washer, and the scrubber.

Among the many applications of chemistry, none, perhaps, are at the present moment exciting more attention than those having special reference to the purification of gas. It is much to be regretted that our knowledge of this subject is not more *exact* in its nature, being, as it is in most cases, limited to general principles. It is more especially to the liquids obtained from the three vessels now under consideration—viz., the condenser, the washer, and the scrubber—liquids known under the general name of "gas liquor," that the want of a strictly chemical and quantitative examination is most keenly felt, and any investigations of this nature would certainly be attended with results, the value and importance of which would well repay any labour expended on them. Until the gas world is in possession of facts of an exact nature in this direction, it is obviously as impossible to estimate the amount of purifying work performed by the various contrivances in use for the elimination of ammonia, as it is to decide, *inter alia*, upon their comparative efficiency.

To come more definitely to the subject in hand, whether the scrubber or the washer be used for the elimination of ammonia, the products which are formed, and the changes which occur, are identically the same in both cases, the difference, if any, being one merely of degree. There are present in the crude gas, as it leaves the hydraulic main, ammonia, sulphuretted hydrogen, and carbonic acid, more or less mixed with suspended tarry impurities, which latter are removed during the passage of the gas through the condenser. Most of the more condensable salts of ammonia are also at this stage likewise removed, together with some carbonate and sulphide of ammonium. Among the more fixed salts of ammonia in the liquor passing from the condenser may be enumerated the sulphocyanide, sulphate, and hyposulphite, all of which are invariably present in varying quantities. The partially purified gas now passes to the scrubber or washer, as the case may be; and it is at this point in the purification that, practically speaking, the whole of the ammonia is removed, more especially if the most improved form of the Mann scrubber be employed. The liquor which is now obtained contains a large quantity of ammonia in various combinations, and will receive greater attention as we proceed. It is, perhaps, scarcely within the province of the present article to discuss the comparative merits of the scrubber and the washer, but, as far as chemistry can decide, the use of the latter vessel, in the form advocated by Mr. George Anderson, appears to be attended with very striking results, accomplishing almost all that can be desired, with the addition of a little scrubbing power. It should always be borne in mind that the removal of ammonia from gas, by whichever of the more accepted means it may be accomplished, is not only important on account of its great commercial value, but also by reason of its efficiency as a purifying agent for the removal of sulphuretted hydrogen and carbonic acid, and that the greater the amount of these impurities which can be thus eliminated, the less will be the subsequent work devolving on the purifiers proper. In the admirable paper read by Mr. George Anderson before the last meeting of the British Association of Gas Managers, that gentleman took a step in the right direction in showing, by actual quantitative results, that, where gas liquor was made to perform its full work as a purifying agent, a great and corresponding saving was effected in the amount of extraneous purifying material required per ton of coal carbonized. Ordinary gas liquor is seldom made to perform the greatest amount of work of which it is capable, chemical examination almost always revealing the existence of varying amounts of ammonia in an uncombined state, which should obviously not be the case if the liquor was used to its utmost capability. The less free ammonia which this liquid contains the greater has been its efficacy in purification. The importance of this distinction will be the more realized when a calculation is made on the theoretical purifying power of the gas liquor obtainable from a ton of ordinary coal. Taking 20 gallons of 10 oz. liquor as a fair yield, the amount of absolute ammonia which this quantity would contain would be 69·4 ounces. This is capable of uniting with 48·2 cubic feet of sulphuretted hydrogen, or a similar quantity of carbonic acid. If the yield of gas be taken at 9500 feet per ton, it is found, as a final result, that the gas liquor obtained from a ton of coal is capable of eliminating no less than 0·5 per cent. of carbonic acid, or sulphuretted hydrogen from the crude gas. Unfortunately, as has before been remarked, the comparative scarcity of exact data, in the constituents of gas liquor, precludes our knowing, with any accuracy, to what degree either scrubbers or washers are performing their work as purifiers.

In the paper to which we have referred, Mr. Anderson shows the increased amount of gaseous impurities which are eliminated from crude gas by well-constructed washers, and the consequent saving of lime as a purifying agent. With all due respect to the efficacy of washers, it must be considered an open question whether a coke scrubber, fed with ammoniacal liquor of moderate strength, would not be found to be more capable of dealing with the removal of sulphuretted hydrogen and carbonic acid than the most efficient washer. The extent to which these gaseous impurities are removed depends in great measure—other things being equal—on the most intimate possible contact of the gas with the purifying material, as well as on the *velocity*, being sufficiently moderate to allow time for the chemical forces at work to come into full play. The scrubber would seem to fulfil these conditions better than such a vessel as the washer, where the gas has to traverse through the liquor in actual bubbles, the *outsid* of which is the only portion which is virtually in contact with the purifying liquor.

With regard to the ordinary liquor from the scrubbers, its constitution is found to be tolerably constant in character, although varying somewhat in the respective amounts of its individual constituents. The greater part of the ammonia exists as carbonate and sulphide, together with some free alkali; other salts, mainly the sulphocyanide, sulphate, and hyposulphite, are likewise present in minor quantity. The amount of the latter compounds is liable to considerable uncertainty, and their existence is, commercially, a continual source of loss to the gas companies. The value of the liquor being at present estimated by its power of saturating sulphuric acid, ammonia, combined with such comparatively fixed acids as the sulphocyanic, hyposulphurous, or even sulphuric, is not indicated by this method of valuation, and is therefore virtually lost to the producers. That fixed compounds of ammonia existed in gas liquor has been probably more or less suspected, and perhaps known, for some time; but the *extent* to which they existed, and the proportionate loss which the gas companies suffered in consequence, was hardly realized until a short time back, when a correspondent (Mr. H. Leicester Greville, F.C.S.) called attention to the subject in the pages of this Journal, and proved, by a table of experiments, that the fixed ammonia was normally present in ordinary gas liquor in proportions varying from 8 to 63 per cent. of the indicated ammonia. The publication of these results has rendered necessary a means of valuation different from that at present in use; and although distillation with an alkali gives the whole of the ammonia, it is to be hoped that some more convenient process will ere long be discovered to meet the exigencies of the case.

In some cases where a scrubber charged with fresh coke is brought into action, it is found that the ammonia in the liquor becomes "fixed" to a most remarkable extent, and in one or two cases which have recently occurred this has attracted considerable attention, and numerous conjectures have been made as to the cause. In those cases where the ammonia becomes to a large extent fixed when a fresh scrubber has been started, it is found that such fixation is due to the abnormal production of sulphuric and hyposulphurous

acids, which, combining with the ammonia present, forms the sulphate and hyposulphite of ammonia. Many conjectures have been made to account for the excessive production of these sulphur acids; but the question is still in an extremely unsatisfactory condition, for, although it is quite possible that when a scrubber charged with fresh coke is first started, sufficient oxygen is present in the pores of the coke to cause an oxidation of the sulphuretted hydrogen and sulphide of ammonium present, yet the production of the sulphur acids, and consequent fixation of ammonia, continues for a period considerably longer than would probably be the case if there was not some other less understood cause at work. Coke charged with atmospheric oxygen would act in a similar way to charcoal in promoting oxidation, but to a less degree. The action would be the formation of sulphuric acid and water from the direct oxidation of the sulphuretted hydrogen, and sulphide of ammonium in the crude gas, but the liquor from scrubbers acting in this abnormal way contains a large quantity of hyposulphite of ammonia, and the presence of this substance is by no means so easily accounted for. The most probable explanation of its formation is founded on the reaction of sulphurous acid and an alkaline sulphide. Sulphide of ammonium is a normal constituent of crude gas, which likewise contains a small quantity of sulphurous acid, but not in anything like sufficient quantity to account for such a large quantity of hyposulphite. If, however, we admit, that under certain conditions, sulphuretted hydrogen or sulphide of ammonium could suffer a limited oxidation on meeting with the condensed oxygen in the pores of the coke contained in the scrubber, and give rise to *sulphurous* acid instead of *sulphuric*, the formation of hyposulphite would become more intelligible.

We should then have the equation

$$2\,NH_4\,S + 3\,SO_2 = 2\,NH_4O, S_2\,O_2 + S$$

in which the sulphide of ammonium and sulphurous acid mutually react on one another with corresponding formation of hyposulphite. That this view of the case is a correct one can hardly be advanced; it has only, perhaps, the merit of probability.

Before quitting this part of the subject, there is one other condition under which large quantities of sulphur acids would unquestionably be formed, and that is when through any cause there is over-exhaustion. Under these conditions air would be drawn in through the tar seal of the hydraulic main during the drawing and charging of the retorts, and in the event of any crack or flaw in the retorts themselves, furnace gas charged with sulphurous acid would be drawn in. Either of these two conditions would lead to a fixation of ammonia in the gas liquor, the ingress of furnace gas furnishing sulphurous acid with corresponding formation of hyposulphite, while the admission of air would furnish oxygen, and cause the subsequent oxidation of sulphuretted hydrogen and sulphide of ammonium. A great evil in this fixation of ammonia, and one, perhaps, not sufficiently appreciated, is the loss in purifying power sustained by the liquor when so much of its ammonia becomes, as it were, "bound up." The purifying power of any sample of liquor depends obviously on the amount of free ammonia which it contains, for in this consists its power of absorbing sulphuretted hydrogen and carbonic acid; and in cases where a larger amount of fixed acids are present than usual, the liquor is deprived of a corresponding amount of its capacity for purification. If inquiry were made, it would be most probably found that on works where the scrubbers were producing abnormal liquor, the work of purification was more difficult.

Enough, perhaps, has now been said on the subject of the fixation of ammonia in gas liquor, and the excuse for dealing with this portion of the subject at such length, must be the importance of the question, and its comparative novelty. It is now proposed, as a conclusion to the present paper, to touch upon a discovery which appears likely to furnish results of the greatest importance.

The patent recently taken out by Mr. Hills for the treatment of gas liquor will very likely mark a new era in gas purification, for if the possibility is admitted of removing the sulphuretted hydrogen and carbonic acid from coal gas to an unlimited extent, by means of a substance produced during its actual manufacture, the importance of the question can hardly be over estimated. The readers of this JOURNAL will probably remember the specification of Mr. Hills' process for treating gas liquor, and that his method consisted mainly in heating the liquor to a temperature of 180° Fahr., by which the sulphuretted hydrogen and carbonic acid which it contained are liberated in the gaseous form, leaving the greater part of the ammonia behind, and that the liquor so purified could be then used for again removing its equivalent of impurities from the crude gas. The process is now being tried on the works of the South Metropolitan Gas Company on a working scale, by Mr. Livesey, and the results of his experiments will be anxiously looked for by the gas world. The mere fact of gas liquor giving off much of its combined gases at a temperature so moderate as 180° Fahr. is, in itself, extremely curious, and, knowing that the sulphuretted hydrogen and carbonic acid in the liquor are really, in the strictest chemical sense, combined in definite quantity with the ammonia present, it is all the more surprising that the application of a gentle heat should be sufficient to overcome the usually strong force of chemical affinity, and literally break up the sulphide of ammonium and carbonate of ammonia present, causing them to become more or less decomposed. The following equations represent the changes which occur:—

$NH_4\,S$ becomes NH_3 and HS

$NH_4\,O, CO_2$ becomes $NH_3 + HO + CO_2$;

the NH_3, ammonia in the free state, remaining behind dissolved in the water of the gas liquor. It will be remembered that Mr. Hills makes provision for arresting any ammonia which escapes at the same time as the evolved gases, by passing the whole of the gaseous products through a kind of small scrubber charged with coke, and through which the original liquor, heated to a temperature of 160° Fahr., is percolating. It is presumed that the liquor at that temperature arrests the greater part of the gaseous ammonia, if any, which is present, allowing the sulphuretted hydrogen and carbonic acid to pass on unabsorbed, and which, being thus isolated, can be removed by suitable means. It would be interesting to learn what actually takes place here, for the decomposition of the liquor might take place in two ways, and it would be important to learn the cause of the distinction, if any, which exists. In the one case the heating of the liquor to the specified temperature (180° Fahr.) might at once cause the decomposition of the sulphide and carbonate of ammonia present, with consequent liberation of sulphuretted hydrogen and carbonic acid, very little ammonia at the same time passing off; or, in the other case, the primary action might be the partial volatilization of the volatile ammonia salts at the same time that they were partly decomposed. In the second case, it becomes a question whether the liquor at 160° passing through the scrubber is sufficient to finish the decomposition by arresting the ammonia, but permitting the gases with which it is (at this temperature) but feebly combined to pass on. In either case, the final result would be practically the same, but the chances of a loss of ammonia in the second case would, perhaps, be greater. Samples taken from the boiler itself, from the tank of original liquor, and from the liquor which is running into the boiler from the scrubber, and subjected to chemical examination, would show the true state of the case.

If Hills' process should eventually prove to be a commercial success, the practical result will be an immense saving of lime and oxide, perhaps ending in totally dispensing with these purifying agents. It would be quite possible, by suitable means, to prepare an ammoniacal liquor richly charged with sulphide of ammonium, in order to specially deal with the removal of the bisulphide of carbon impurity, and, with this addition, Hills' process would prove itself capable of dealing with all the recognized forms of impurity in crude gas, a result so important that no trouble is too great in order to arrive at a definite conclusion in the matter. It is to be hoped that Mr. Livesey will cause all the necessary experiments to be made, and will communicate the eventual result to the public; to whom he would be rendering as great a service as he would to the gas world generally.

(*To be continued.*)

Correspondence.

EFFICIENT VALVES FOR PURIFIERS.

SIR,—In reply to the inquiry on the above subject in your JOURNAL of the 5th inst., "Querist" cannot do better, in my opinion, than erect two sets of four purifiers, and employ Walker's dry centre-valve (which is perfectly reliable) to each set. The first set to be used for abstracting the carbonic acid, and the next set for abstracting the sulphur in all forms.

Jan. 6, 1875. I.

SCRUBBERS.

SIR,—In the article on Mann and Walker's scrubber last week, a reference is made to "different methods of charging scrubbers," to which is added the remark, "but all have ended in the resort to some expensive supplementry process of chemical ingredients in purifiers to complete purification."

It is further stated that, "even with scrubbers drenched with clean water," "ammonia will pass to the extent of from 10 to 20 grains per 100 feet," thus "defeating all efforts at purification in this direction."

I admire the ingenuity and the efficiency of Mann and Walker's arrangement for distributing the water, but that it is the only efficient method of purifying gas from ammonia, the evidence of your pages and the experience of numbers of gas managers completely disprove.

Works of all sizes may be found in all parts of the kingdom, where the ammonia is completely removed without the aid of chemical ingredients, and where the quantity of ammoniacal liquor made is quite as great as at those works where Mann and Walker's scrubbers are used, and this result is attained without gearing requiring power to drive it.

For my part, I am perfectly satisfied with the *self-acting* Barker's mill, which, when properly constructed, may be depended upon to work for months together without trouble or any attention beyond looking at it every morning to see that all is right. My objection to the use of coke for charging scrubbers is, that it requires periodical changing, in consequence of the interstices becoming choked, and thus impeding the flow of the gas. This changing involves nuisance and loss, for the spent coke used as fuel lets down the heats rather than heats the retorts. I, therefore, use my arrangement of thin boards, which I have found, after eight years service, to remain as clean and as effective as when first fitted in the scrubber. GEORGE LIVESEY.

South Metropolitan Gas-Works, Old Kent Road, Jan. 11, 1875.

SIR,—We have read with some interest the article in your last issue on the subject of scrubbers, agreeing, as we do, with the importance you assign to this part of modern gas apparatus; for there is no doubt that, in these days of scientific gas manipulation, the scrubber, when properly constructed, must be looked upon as essential a part of the purifying apparatus as that portion of the apparatus technically known as the "purifiers" themselves.

Our object, however, in addressing you is to take exception to what you say about the "Gurney jet" mode of distribution. We have given considerable attention to this question of distribution, for herein, to a considerable extent, consists a scrubber's successful action, and certainly, although it does not possess the charm of novelty, our experience so far is favourable to this plan—that is to say, when properly arranged and supplied under proper conditions, for then we have found it very successful, being practically perfect in the equality of the distribution, and under entire control as to the quantity supplied; and besides others, it has the inherent and by no means slight advantage of possessing considerable simplicity, obviating all complicated gearing and special machinery, and the necessary provision for protecting same. We have

erected several large scrubbers under some of the most eminent engineers arranged upon this system, and the result in all cases has been satisfactory.

With regard to the materials used for filling the scrubber, we have had some experience with all those kinds usually employed; but our experience is certainly in favour of that devised by the talented engineer of the South Metropolitan Company, and late president of the Gas Managers Association, Mr. Livesey—viz., thin boards placed edgeways—which he fully described in a paper read by him some years ago before the association.

Apologizing for this claim upon your space, which, however, if you think the matter sufficiently important, we shall be glad if you will accord us in your next issue.

Millwall, London, E., Jan. 7, 1875. SAM. CUTLER AND SONS.

SPECIFIC GRAVITY APPARATUS.

SIR,—Surely your esteemed correspondent has not used Schilling's "specific gravity test." No arrangement connected with the balance can equal it in exactness, nor give to the mind such satisfaction. Considering the cost of a good balance, a great number of your humble readers managing small gas-works dare not presume to ask their director for such an instrument. I have used Schelling's test constantly for four years, and am glad to say the specific gravity test by it is the simplest operation connected with gas analysis.

Of course, a good balance is indispensable; but I advise your readers, if they have one, not to use it for the specific gravity test, because all the emergencies connected with Schilling's test are connected with photometric testing, and, therefore, come in as equals in estimating the value of the gas. The test ought to be used with an Erdmans float inverted in the inner vessel, and I feel assured that your correspondent, Mr. J. Reid, would find this test give him much greater satisfaction than the one he describes. W. L.

THE WORCESTER GAS COMPANY.

SIR,—I read in late copies of your JOURNAL, with much interest, the report made by Messrs. Carter and Carter, accountants, of Birmingham, to the Worcester Corporation, upon the filed accounts of the Worcester Gas Company; and also the reply of the secretary of the gas company to Messrs. Carter. The letter puts quite a different face upon the report, and reveals something which may be deemed historical in relation to gas-making—1. The Companies Clauses Consolidation Act was passed in 1845; 2, the Worcester New Gaslight Act in 1846; and 3, the Gas-Works Clauses Act in 1847, under which last Act all subsequent gas Acts were to be incorporated. Now the question arises, How many gas Acts were passed in 1846 under the then new Joint-Stock Companies Act, commonly called the Companies Clauses Consolidation Act, 1845? And how many are there now (1875) trading under its provisions, like the Worcester Company with their special Act of 1846?

Some of your readers will, perhaps, be able to answer this query.

Jan. 7, 1875. H. H.

Legal Intelligence.

WORSHIP STREET POLICE COURT.—THURSDAY, JAN. 7.

(*Before Mr.* BUSHBY.)

SUMMONS FOR CUTTING OFF GAS.

The adjourned summons against the Commercial Gas Company for cutting off the gas from the house of William Scott, a publican in the Whitechapel Road, without notice, was resumed, and judgment was given by the bench thereon.

Mr. DOUGLAS STRAIGHT appeared, as before, for the company, and Mr. KIDD for the complainant.

The facts of the case were reported in our columns of the 29th ult. The company had demanded security for their gas from the complainant, and alleged that he had consented to receive his accounts by the month. This was, however, denied. Accounts sent in for two months remaining unpaid, the gas was cut off.

Mr. BUSHBY, in giving judgment, said that the case turned on the question, whether the gas-rate was in arrear when the gas was cut off. The answer depended on whether the agreement was a monthly or a quarterly one. If quarterly there would be no arrear, as only two months had expired at the time the gas was cut off. It was not disputed that up to May last the agreement was for payment by the quarter. The company, however, asserted that in the following month the arrangement to pay monthly was substituted by "mutual agreement." It was admitted that the complainant objected to it, but it was said that on the company expressing dissatisfaction with the old arrangement, and stating their intention of sending in the accounts monthly, the complainant acquiesced by saying "Very well." This he denied; and a notice from the company, stating that the accounts would be collected quarterly, was produced by him for the purpose of showing that they did not believe that a monthly agreement had been substituted. It was not to be supposed that a mere "Very well" was an acquiescence by a consumer, when the gas company threatened to send in their account more frequently, that he would pay more frequently. Cutting off the gas was a very stringent proceeding on the part of the gas company, and to justify such, very strict evidence of a new contract would be required. In this case, he (Mr. Bushby) had had no such evidence placed before him. By section 11 of the Act 34 & 35 Vict. (the Gas-Works Clauses Act Amendment Act), cap. 41, the company, if anxious about obtaining their money, had the easy remedy of a notice in writing to compel the complainant to give security. On the other hand, they were liable to a fine of 40s. for every day's default in supplying the gas contracted for. He (Mr. Bushby) would not have hesitated to inflict the full penalty, but that he gave the company the benefit of the doubt that they really believed they had substituted the monthly for the quarterly contract. That being so, they had only been guilty of a mistake. It was necessary, however, to protect the public against such mistakes, and he therefore inflicted a fine of £10 upon the company, and allowed full costs, about £15.

Mr. STRAIGHT said that the company would take a case for the opinion of the Court of Queen's Bench, which Mr. Bushby consented to state.

GREENWICH POLICE COURT.—THURSDAY, JAN. 7.

(*Before* Mr. PATTESON.)

EXPLOSION IN A SEWER AT GREENWICH.

The *New Gas Company, Limited*, of No. 22, Walbrook, London, were summoned by the Greenwich District Board of Works, under the Metropolis Local Management Act, 1855, for unlawfully placing into a sewer, vested in the district board, certain filth or rubbish—viz., petroleum and the refuse arising from the manufacture in the process of the distillation of petroleum.

Mr. SPENCER appeared in support of the summons, and Mr. CARTTAR for the defendants.

The proceedings arose out of the fact that, on the 27th of November last, an explosion took place in the southern low level sewer, near Greenwich Hospital, by which much damage was done. Fortunately the men employed in the sewer were not at work at the time, or loss of life would have been the consequence. The accident having being brought under the notice of the Metropolitan Board, the consideration of the cause of it was referred to the Works and General Purposes Sub-Committee, who subsequently reported that they had consulted Mr. Keates on the subject, and received from him an expression of opinion that the only possible causes of an explosion of the kind might be reduced at the outset to three—viz., foul gas generated in the sewer itself, or in the sewers or drains connected therewith; a leakage of lighting gas from the street-mains into the sewer; or the presence of combustible vapour arising from some material of the character of the more volatile kinds of petroleum. Mr. Keates stated that a careful examination of the sewer and of all the facts connected with the explosion led him to the conclusion that the accident was attributable to the third of the above-mentioned causes, and that the source from whence the petroleum was derived was the manufactory in which the New Gas Company prepare the material used in their patent process of gas-making. Upon this expression of opinion being conveyed to the district board, the present proceedings against the company were instituted. Before the evidence was gone into, a plan prepared by Mr. Smith, the engineer, was produced, showing the line of local sewers, two in number, in the district of the company's works, and named Chester Street and Waldridge Street sewers. The latter has a clear run from the eastern end of the town of Greenwich, under Greenwich Hospital, into Clarence Street, where the explosion occurred on the 27th of November last, and thence to the pumping-station of the Metropolitan Board of Works at Deptford Creek, whence the contents are pumped into the metropolitan main sewer, and carried to the Crossness outfall. The two sewers named are contiguous in lineage with each other, and are both flushed with water from the Thames by means of pipes at a higher elevation than the entrances to the sewers. It was shown that the works of the company were the only means of inlet into the Waldridge Street sewer, and that since such inlet had been permitted, smells which were never before experienced had been perceived. After the explosion, and on the evening of the 9th of December, the foreman of sluices went into the sewer at a spot near the drains, and took a sample of water in a wine-bottle, and a second bottle and some solid matter on the 24th of December. These samples had been forwarded to Mr. Keates.

The accuracy of the plan, and the facts above stated as to taking the samples having been proved,

Mr. CARTTAR, in cross-examining the engineer and foreman of sluices, elicited that tar-paving manufacture was carried on by both the parish authorities of Greenwich and the firm of Messrs. Mowlem and Co., but it was denied that this could have any effect upon what was taken from the sewer near the company's works.

Mr. *Keates*, examined by Mr. SPENCER, said that on the 10th of December he received a claret wine bottle containing fluid, on the surface of which there was clearly appreciable, to the extent of 1-16th, something of an oily nature, and smelling of petroleum. The smell did not resemble the washings from the manufacture of tar paving. In his opinion it came from works where the process of manufacturing from petroleum was carried on, and in large quantities it would be both dangerous and noxious. He had visited the works. At the time of the explosion the men in the sewer would have been killed or seriously injured if they had continued there half an hour longer. The introduction of petroleum into a sewer was dangerous, and no one could tell what quantity could be let in with safety. He had seen a second sample bottle of fluid taken from the sewer near the company's works, and also solid matter, both of which were impregnated with petroleum.

In cross-examination by Mr. CARTTAR, *witness* declined to define the meaning of the words "filth" and "rubbish," contained in the Act of Parliament, observing that the language was vague. In his view, filth and rubbish were everything allowed to enter a sewer which was not intended to be carried away by a sewer.

In answer to Mr. SPENCER, the witness said that the sample taken on Dec. 10 had a stronger film of oil than that taken 14 days afterwards.

Mr. CARTTAR, for the defence, contended that no case had been made out against the company, and said he would call witnesses who would show that there was nothing deleterious or dangerous in the water discharged from the company's drains, which found its way into the local, and thence into the main sewer. It was possible that benzoline or petroleum might have been discharged in large quantities into the Thames, and that water taken from the river for flushing the sewers might have contained that which was now complained of. The distillation of petroleum by the company was carried out for the manufacture of gas, which the company were able to supply at a reduction of 50 per cent. upon the price of coal gas. The Paddington Station of the Great Western Railway and the town of Tunis were lighted with the gas so produced. He believed that Mr. Keates would bear him out in the truth of what he stated that the Metropolitan Board of Works authorities were in communication with the company for the purpose of providing cheaper and better gas for the public.

Mr. *Keates* said he had no official knowledge that there had been any such communication as that mentioned.

Dr. *Loutit* (of Greenwich), Mr. *Ruck* (the patentee of the New Gas Company's process), and three *employés* were then examined, and it was proved that no petroleum had been distilled at the works between the 5th and 12th of December, nor since the 17th of December. It was denied that after the distillation the spirit was allowed to be discharged with water into the sewer, such spirit having a marketable value of 10d. to 14d. per gallon for lamps, and that no explosion would occur in sewers of petroleum unless flame was brought into contact with it. Dr. Loutit added that he had acquired particular knowledge of the qualities of petroleum from his visits to foreign countries; and that in America, among physicians and other medical men, the spirit of petroleum had entered into medicinal treatment, both internally and externally. As proofs that no spirit of petroleum was to be found in the discharges into the sewer, the sample of the fluid taken on the 10th of December was experimentally tested in court with the hydrometer, and also tested with a lighted match, but there was not the slightest flame.

Mr. PATTESON said that the evidence produced did not satisfy him that the nuisance complained of came from the company's works, and the summons was dismissed.

Mr. CARTTAR asked for costs to be awarded to the company.

Mr. PATTESON said that, after what had occurred, it was an important investigation, which the district board had a right to have determined, and he refused costs.

LAMBETH POLICE COURT.—THURSDAY, JAN. 7.

(*Before Mr.* ELLISON.)

EXTINGUISHING STREET-LAMPS.

Weigert Pume, a German, aged 22, and described as a clerk, residing in Lewisham Road, Forest Hill, was charged before Mr. Ellison with extinguishing several street-lamps.

Police-constable 439 P said he saw the defendant, with three other young men, on Wednesday night, going along the Crystal Palace Road. The defendant extinguished one of the street-lamps, and then he and his companions made their way into the Avenue Road, where defendant put out four other lamp-lights. They were all stopped, and defendant admitted the offence.

Mr. ELLISON ordered defendant to pay a penalty of 40s., or one month. The money was paid.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.—At the Meeting of the Board on Friday last, a letter was read from the Haberdashers Company, stating, with reference to the proposal of the board to take certain land of the company at New Cross, for the establishment of gas-works, that their property would be materially injured by such works, and would be objectionable, as they are about to erect schools and a new church in the neighbourhood. The communication was referred to the Parliamentary Committee.

MARYLEBONE VESTRY.—At the meeting on the 7th inst., letters were received from the Imperial and Chartered Gas Companies, stating, in reply to complaints made, that the reason for so many lamps not having been lit of late was owing to the cold weather causing deposits of the naphthaline, which it was impossible to prevent. Mr. G. Edwards remarked that at least 400 lamps in the parish had been out night after night. This matter was assuming a serious aspect, and must be grappled with at once. If the gas was not supplied the vestry must object to pay for it. He was sure the law was on the side of the vestry, and he moved the reference of the question to a committee. Mr. Emery seconded the motion, and hoped the meter system, which had been adopted, with a saving, in St. Pancras, of at least £700 a year in the cost of public lighting, would be adopted in Marylebone. The motion was agreed to.

METROPOLIS WATER SUPPLY.

AVERAGE COMPOSITION AND QUALITY OF THE METROPOLITAN WATERS IN THE YEAR 1874.—The following are the returns of the Society of Medical Officers of Health:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
	Grs.	Grs.	Grs.	Grs.	Deg.	Deg.
Thames Water Cos.						
Grand Junction . .	18·46	0·069	0·114	0·002	14·5	3·6
West Middlesex . .	17·98	0·039	0·125	0·000	14·2	3·5
Southwark & Vauxhall	18·61	0·071	0·119	0·002	14·6	3·7
Chelsea	18·43	0·067	0·118	0·002	14·4	3·6
Lambeth	18·44	0·068	0·119	0·002	14·4	3·6
Other Companies.						
Kent	27·74	0·002	0·233	0·000	21·0	5·8
New River	18·49	0·019	0·122	0·000	14·6	3·5
East London . . .	18·54	0·039	0·146	0·002	14·7	3·7

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c. is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

These are the average results of the analyses of the samples of water taken during the year from the mains of the several companies, and they show that the proportions of saline matter in the water taken from the Thames have ranged from 17·98 grains per imperial gallon to 18·61 grains; the average being 18·38 grains. In the case of the New River water the average has been 18·49 grains, and in that of the East London, which also derives its chief supply from the Lea, the average has been 18·54 grains; while in that of the Kent Company, which obtains its supply from deep wells in the chalk, it has been 27·74 grains per gallon. These numbers are very close to the averages in each case for the preceding five years, when the average amount of saline matter in the Thames supply was 19·17 grains; for the New River and East London Companies, 18·89 and 19·71 grains respectively; and for the Kent Company, 27·65 grains. It appears, indeed, that the fluctuations in these proportions are not considerable, even from season to season, for in the cases of the Thames companies, as well as the New River and East London, the proportions of saline matter were only about 2 grains above the average in the winter season, when the proportions were largest, to about 2 grains below the average in the summer time, when the amounts were smallest. In the case of the Kent Company's water the fluctuations were even less than these; for during the whole year the range in the proportions of saline matter has been from 27·03 grains to 28·43 grains, which is less than a grain and a half per gallon. The organic impurities in the several samples of water are represented by the proportions of ammonia present, and by the amount of oxygen required for the oxidation of oxidizable matter. In the case of the Kent Company these have been hardly appreciable. In that of the New River Company the amount of oxygen required by organic and the oxidizable matter did not exceed one grain for 50 gallons of water. In that of the West Middlesex it was a grain for 25 gallons of water; and then follows the East London, the Chelsea, the Lambeth, the Grand Junction, and lastly, the Southwark and Vauxhall, in which a grain of oxygen was required for 15 gallons of water. The hardness of the water has ranged from an average of 14·4° in the Thames supply, to 21° in the Kent; the New River being 14·6°, and the East London 14·7°. This hardness has been greatly reduced by boiling the water for a quarter of an hour, when the Thames water was only 3·6°, and the Kent 5·8°. As regards turbidity, the water of the Kent, New River, East London, and West Middlesex Companies has been constantly bright and colourless; but that of the other companies has frequently been more or less turbid, the turbidity being very marked when the water was seen in large volume, as in a glass tube 2 feet in length, which is the test always used. The turbidity has been caused by a very minute quantity of finely divided clay, derived from the bed of the river. The quantity has been too small for actual determination, but when seen under the microscope it has been found to consist chiefly of amorphous mineral matter, with minute fragments of vegetable tissue, and a few filaments of fungoid and confervoid growth, together with an occasional animalcule of the diatomaceous character. The same appearances are observed in the sedimentary matters of all rivers, whether they receive sewage or not. Even in the pure water of the Nile, many hundreds of miles above Cairo, the same appearances are visible, and to a much greater extent than in the Thames water. Nearly all this matter is removed by subsidence and filtration, and in illustration of the effects of this, I may refer to the composition and quality of the Thames water at Hampton before and after filtration by the West Middlesex Water-Works Company. During the last eight months of the year samples of the water have been taken from the river as it enters the subsiding reservoirs of the company, and these compared with the same water taken from the mains of the company in St. Marylebone have shown the following remarkable differences:—

	Thames at Hampton. Grains.	Water from Company's Mains. Grains.
Total solid matter per gallon	17·83 . . .	16·86
Nitrogen as nitrates "	0·121 . . .	0·125
Ditto as ammonia "	0·002 . . .	0·000
Ditto as albuminoid "	0·007 . . .	0·004
Oxygen required on oxidation	0·098 . . .	0·039

The hardness also was reduced from an average of 14·3° to 13·1°, and, while the samples of the former were always turbid, those of the latter were bright and colourless. It is manifest, therefore, that by the aid of subsidence and filtration a very bright and good water may constantly be secured.

The average amounts of water supplied by the companies during the year has ranged from 31·4 gallons per head per diem, in December last, to 37·5 gallons in July and August. The daily quantities in each month of the year have been as follows:—

1874.	Gallons per Diem.	Houses supplied.	Gallons per Head per Diem.
January	109,118,500 . . .	508,329 . . .	32·5
February	109,013,458 . . .	508,465 . . .	32·5
March	109,544,116 . . .	508,818 . . .	32·6
April	112,124,179 . . .	509,017 . . .	33·4
May	121,281,889 . . .	510,033 . . .	35·7
June	125,689,091 . . .	510,499 . . .	36·9
July	127,563,243 . . .	512,203 . . .	37·5
August	127,649,728 . . .	512,540 . . .	37·5
September . . .	120,871,501 . . .	512,825 . . .	35·5
October	116,336,586 . . .	513,520 . . .	34·2
November . . .	111,277,251 . . .	513,772 . . .	32·7
December . . .	106,947,278 . . .	514,118 . . .	31·4
Yearly average . .	116,451,402 . . .	511,178 . . .	34·3

About 60 millions of gallons have been derived daily from the Thames, about 39 millions from the Lea, and the rest from deep wells in the chalk, and about 80 per cent. of the daily supply has been used for domestic purposes.

HY. LETHEBY, M.B.

BILSTON GAS COMPANY.

The Twenty-ninth Annual Meeting of Shareholders was held on the 4th inst.—Mr. W. HATTON in the chair.

The CLERK (Mr. J. S. Reeves) read the following report of the directors:—

The directors herewith present to their shareholders their twenty-ninth annual report, together with a statement of accounts. The trade account for the year exhibits a net profit of £1625 13s., which, with £719 3s. brought from last year's account, will make a total of £2344 16s. at their disposal. This sum is insufficient to pay the usual dividend, but to enable them to continue it the directors propose to take from the reserve-fund £55 4s.

Half year's dividend of 4s. per share, paid Aug. 1, 1874	£1200 0 0
Half year's dividend of 4s. per share, payable Feb. 1, 1875 . . .	1200 0 0
	£2400 0 0

The directors regret that the profits of the year have not been equal to those of former years, which is attributable to the high prices they have had to pay for coals purchased on contract, and the low prices obtainable for coke. The long-continued strike in the coal trade during the early part of the year not only diminished the supply of coal, and greatly enhanced its price, but, by stopping the iron-works and furnaces of this district, reduced the demand for coke, and greatly diminished its value as a residual product.

Your directors observe that gas companies generally have during the past year experienced difficulties of a similar character, and have been compelled, in many instances, to withdraw large sums from their reserve-funds to enable them to pay dividends. It is with some satisfaction, therefore, that your directors report their ability to declare the usual dividend, by drawing upon the reserve account for so small a sum.

The old contracts for coal have expired, and new ones have been entered into at lower rates. The directors will be glad, when the cost of the manufacture of gas is sufficiently reduced to enable them, to reduce the rates to consumers.

The resolutions which were passed at the extraordinary general meeting of the shareholders, held on the 5th of January last, and confirmed at a meeting held on the 17th of March, authorizing the extension or removal of the existing works, and the creation of additional capital, have not been acted upon, owing to the high prices of building materials, and other causes.

The following statements of account were appended to the report:—

Trade Account, for the Year ending Sept. 30, 1874.

Dr.		*Dr.*	
Stock	£2,034 0 0	Sales	£5,638 1 4
Purchases	3,170 17 4	Ditto	5,198 12 2
Ditto	2,909 4 5	Ditto	2,256 19 9
Ditto	2,036 10 6	Ditto	3,094 0 1
Ditto	2,083 8 5	Stock	666 18 9
Deterioration of works for one year	564 0 0		
Wages	2,249 3 4		
Discounts for sales of coke, &c. .	182 3 1		
Balance (profit)	1,625 13 0		
	£16,855 0 1		£16,855 0 1
			£1,625 13 0

Works Account.

Works, as per statement made Sept. 30, 1873	£28,290 19 9
Amount expended in maintenance of works and plant during the year .	495 9 7
Ditto paid on account of purchase of land	200 0 0
	£28,986 9 4
Less deterioration of works for one year.	564 0 0
	£28,422 9 4

Reserve-Fund Account.

Amount required to make up dividend for year 1874 . . .	£55 4 0	Amount as per account published Sept. 30, 1873	£2,406 0 6
Balance	2,390 6 7	Interest	39 10 1
	£2,445 10 7		£2,445 10 7

The CHAIRMAN, in moving the adoption of the report, said he regretted that it was not of a very favourable character; but the very causes which in former years had operated to increase the prosperity of that and many other companies had, during the past year, had a contrary effect, and had diminished the profits. Persons who had to keep large stocks on hand found themselves effected by the rise and fall in prices. This company had to have large stocks of coal, and they were compelled to make contracts from time to time. These contracts were generally made in the summer months, when coal was at the lowest price; and for the last three or four years the company had made very good contracts, which had been favourable to the balance-sheets. But the turn must come, and, accordingly, they had recently found the prices of coal greatly increased, and had suffered loss in their contracts. However, the coal they bought at higher rates, which prevailed some time ago, had now been used, and they had since made better contracts. The only mistake the directorship had made was that they had omitted to advance the price of gas immediately the price of coal was increased. The consumers had the benefit of the moderate prices charged for gas for two years after the price of coal went up, as the directors thought the high prices they had to pay for coal would not last long, and that the contracts would run out during that time. It was found, however, that coal remained at the increased price longer than had been anticipated, and the directors were at last compelled to increase the price of their gas. It would be a source of pleasure to them, however, when the time came, to reduce it again, but that time had not arrived at present. He wished that the balance-sheet was more satisfactory, but all business men knew that they had to bear fluctuations in price.

Mr. FOWLER seconded the motion.

Mr. CREMONINI asked what amount of loss had been sustained through the contracts.

The CHAIRMAN said it had not been on one contract only but the general supply of coal that had caused the loss. They were using 10,000 tons of coal a year, and if they were compelled to pay only 2s. per ton more there was a loss to them of £1000; so the shareholders would see how heavy the recent advances must have been to them.

Mr. CREMONINI said the directors of the Wolverhampton Company had been

very cautious in purchasing coal from week to week whilst the prices were so high, and no man of experience would have thought it possible for coal to continue at such prices as it had been. Last year he pointed out that the company were passing through a period of change, and this was true, for but for the surplus they had from last year they would now have been unable to declare the usual dividend. He thought it would be some time before the directors would be able to reduce the price of gas. They must not forget that there were the interests of the shareholders to be looked to, and the directors would not be justified in reducing the price until there was good reason for doing so. He saw that £200 had been spent on account of purchase of land for the transfer of the works; but what condition would the company have now been in if the whole scheme had been carried out? He had been alone in speaking against the expenditure of £20,000, but what man of common sense would now say that it was a wise step to go to the expense of erecting new and more extensive gas-works in a town where there was so little prospect of extensions. He thought, however, that now they had commenced it would be better to go on with the work, and so avoid the payment of interest.

The resolution was put and carried.

Mr. CREMONINI moved the payment of a dividend of 4s. per share on the 1st prox., which was seconded by Mr. KEARNS and carried.

The retiring directors and auditors were severally re-elected.

Mr. HOLLIDAY proposed a vote of thanks to the directors, to whom, he thought, considerable credit was due for having conducted the affairs of the company so satisfactorily during such trying times.

Mr. CREMONINI seconded the resolution, and desired the chairman to inform the meeting whether it was really the intention of the directors to remove the works.

The resolution having been unanimously carried, the chairman acknowledged the compliment, and again pointed out the difficult nature of the times through which the directors had had to steer the company's affairs. They had been desirous of not throwing any burden upon the gas consumers owing to the increased cost of coal, and they felt that as the company had had the benefit of more favourable times, they should endeavour to bear the difficult ones also. Mr. Cremonini seemed to think it would have been better to have bought coal week by week, but had they done that the probability would have been that during the recent strike they would have got no coal at all; whilst as they had contracts the contractor was bound to supply them, even though he obtained the coal from elsewhere and at a higher price. And then, again, coke had fallen in consequence of the iron-works and other places being at a standstill, so that other companies came into the market. He therefore thought that under all circumstances the results of the year had been very satisfactory. As to Mr. Cremonini's inquiry concerning the removal of the works, he could not say what course the directors would take when the question came to be more fully considered. It must be remembered that the removal was to be effected only if the directors thought fit and that it would be for the good of the company; but considering the high prices of labour and material, it had been thought unadvisable at present to go to such outlay. When the question came forward it would meet with the best consideration, and everything that would be done would be with a desire for the good of the company. There were, as the shareholders knew, many serious difficulties in the way of a fair and proper distribution of gas in the district, and the directors had felt it desirable to look elsewhere, and see if they could not place the works in a better position, so that they could give a better supply of gas to the people at low rates, and yet pay good dividends to the shareholders.

A vote of thanks was passed to the officers of the company, and a similar compliment having been paid to the chairman for presiding, the proceedings terminated.

ROCHDALE (CORPORATION) GAS-WORKS.

In its local retrospect for 1874, the *Rochdale Observer* of the 26th ult. gives the following interesting particulars respecting the gas-works belonging to the corporation of that town:—

"In reviewing the proceedings of the gas department, instead of confining ourselves to the present year, it is desirable that our remarks should embrace the doings of the past three or four years, so that we may lay before our readers a fair statement of the condition of the works in 1871, the alterations and extensions lately made, and their power for the supply of gas.

"The old works really consisted of three separate and distinct sets of buildings and apparatus, each set complete in itself, and capable of working independently of the other. Altogether there were no less than 310 retorts, three sets of condensers and exhausters, 18 purifiers, and seven gasholders. As an illustration of the disadvantage of having works of this magnitude in so many different and small parts, it may be stated that during the evening, when the consumption was greatest, it was actually impossible to use the five small gasholders, for the very reason that the man in charge was unable to keep the town pipes charged with an even pressure from such small reservoirs; one would have been emptied in less time than the other could have been put on, and the whole five would not have served the town for more than about three-quarters of an hour.

"During the winters 1871-2 and 1872-3, and in fact for several previous years, it was found impossible to manufacture, purify, and store sufficient gas to meet the demands of the consumers, and as the works had by that time become thoroughly dilapidated, the Gas Committee decided to renew or remodel nearly the whole. The cost was large, but as the old works were actually in a dangerous state, apart from any extension, the council were compelled to enter upon the expenditure.

"It is said that scarcely a week passed, during several winters up to 1872, without some accident on account of the faulty state of the old works and apparatus, and that in several instances the workmen were seriously injured.

"The works, as they now stand, cover between 6 and 7 acres of ground. Any townsman who has not visited them during the past six or seven years can scarcely imagine the extent to which they are now developed. The buildings are neatly arranged for economical working, and bear a handsome and substantial appearance. The numerous gas engineers and managers who have visited them agree in ranging them amongst the finest and most compact works in the United Kingdom.

"*Retort-House.*—In this house there are 341 retorts, arranged so that in most cases one fire shall heat seven retorts, and as each retort is capable of producing about 5000 cubic feet of gas per day, the whole is equal to a make of 1¾ million cubic feet in the 24 hours. There is some art in arranging the position of each retort, and directing and controlling the power of the fire or heat current; so that every retort, and each part of every retort, shall be equally hot. This appears to have been fully considered in the new style of setting designed by Mr. Hunter (the gas engineer of the corporation), as the heat from one fire is now so directed and controlled that seven retorts are heated instead of five, as formerly, and the make of gas is now about 35,000 cubic feet, instead of about 23,000 by the old settings, to each fire. The greatest novelty in this house is the self-sealing retort mouth-lids, which require no mortar or 'luting,' and are opened and shut with the greatest ease, simply by an eccentric fastening, worked backwards and forwards in a second of time.

"The house itself is a fine large structure, 100 yards long by 45 yards broad, of good proportions and well ventilated. On each side of the retort-beds is a coal store, where altogether something like 6000 tons of materials may be stacked ready for a winter's consumption, or as a safeguard against strikes or accidents at the pits or on the railway.

"*Exhausters and Engines.*—The use of the exhauster on a gas-work may be somewhat mystical to the uninitiated. These machines have certainly been credited with doing that which a chemist could only characterize as an absurdity. They have often been referred to by busybodies as pumps for pressing air into the gas, so as to enlarge its bulk at a small cost. The fact is they could be used for such a purpose, but only on the principle of "penny wise and pound foolish," as 5 per cent. of air added to the bulk of the gas might be worth 2d., but this admixture would reduce the illuminating power six times *its value*, or a loss of 1s. compared to the gain of 2d. Had we space to spare, a detailed description of this house and apparatus no doubt would interest our readers, but a hasty sketch much suffice.

"The arrangement is novel. There are two 10-horse power high-pressure horizontal steam-engines; each one is connected on the "direct-acting" principle to two exhausters, so contrived that in case of break-down either one, two, three, or four exhausters can be worked together, or one engine can do the work of the other engine, or *vice versâ*, or either engine can do the work of both. All this scheming is necessary when we bear in mind that these engines and exhausters at this season of the year are required to work for weeks together without a stoppage, day and night, Sunday and week days. The engines are of a neat substantial design, in some respects special for the purpose they are used for. It is necessary that they should vary in speed proportionately with the make of gas. This is accomplished by substituting for the ordinary governor one which is controlled by the gas pressure, so that the force or supply of gas controls the speed of the engine.

"The connecting-pipes are at an elevation in the cellar under the engine-house, and so arranged that any and every part can be got at without the slightest difficulty. The tell-tales, pressure-gauges, and photometers are fixed so that a record of speed of engine, pressure, and illuminating power of gas as made, may be taken every moment throughout the day and night. Another engine is fixed for working the distributing apparatus in the scrubbers. The engine-house is a fine building, of good proportions, 40 feet by 30 feet, well lighted and ventilated, in close proximity to the boiler-house, pump-room, mortar-mill, and water-cistern. The object of placing them close together is to economize labour, so that instead of a number of men one man is able to work the whole. In passing we may remark that the pumping of water is of some moment, as it is estimated that not less than 7 million gallons are used per annum at the gas-works. After leaving the exhausters the gas then passes to the scrubbers.

"*Scrubbers.*—Two of Mann's patent scrubbers have been erected, and have been found to act most efficiently in cleansing and scrubbing the gas, and in freeing it from ammonia and other impurities, and so far assisting the purifying processes. They are like two massive towers with house on top, are 12 feet diameter, and stand 50 feet high, each containing about 40 tons of coke, and provided with a constant jet of water by a distributory apparatus worked by steam power. It is found in practice that every particle of ammonia and some other compounds are thus removed from the gas, and as this ammonia is a valuable commercial product, and commands a good price, some advantage is hereby gained independent of the purity of the gas.

"*Purifiers.*—The new purifying-house, and the arrangement of the apparatus for purification is novel and original. The ground floor is reserved entirely for the storing and revivifying of the purifying material, which is hydrated peroxide of iron. In the house recently erected there is a special arrangement for emptying, by simply dropping the material through the purifier bottom; and a novel contrivance for filling, which reduces the labour to a minimum. The purifying apparatus is fixed on the first floor, at an elevation of 13 feet 6 inches from the ground. They consist of six massive boxes, 24 feet square, which replace 12 small old-fashioned boxes, that had become really obsolete. The capacity of these new boxes is 15,552 cubic feet, and they are capable of purifying with ease 1,500,000 cubic feet in the 24 hours. By an entirely new contrivance, the invention of Mr. Hunter, the oxide and lime required in the process are lifted by an hydraulic machine, which economizes a very large amount of labour. The economy of the arrangement for working, and the advantage of having so large an area, may be seen from the fact that last year the gas purified cost, for materials and labour, less than one halfpenny per 1000 cubic feet.

"Two *Station-Meters* are provided for measuring the gas as it is manufactured. The dimensions of these may somewhat surprise the public; one is capable of measuring 45,000, the other 26,000 cubic feet per hour.

"*Gasholders.*—The new telescope gasholder is 126 feet in diameter by 52 feet high, and is a fine piece of workmanship, placed in a tank 128 feet diameter and 26 feet 6 inches deep, which is perfectly water-tight. There are two other gasholders, each 100 feet diameter; one 22 feet high, the other 52 feet. Now, although the capacity of these three holders is 1,160,000 cubic feet, it will surprise the reader to learn that that large quantity was not more than two-thirds sufficient to supply the town last Wednesday (Dec. 23) when the actual consumption in the 24 hours reached 1,721,000 cubic feet. If it is remembered that in 1871, when the remodelling of the works commenced, the capacity of the seven holders then working was only 650,000 cubic feet, the imperative necessity of the extension is absolutely demonstrated; and although the amount of capital sunk seems to be large, still, when the producing power of the works is considered, it really bears a favourable comparison with any other works in the kingdom in this particular. It must be evident that these vast alterations and extensions cannot have been decided upon by the Gas Committee without great consideration and excessive labour on their part, and great skill and attention in their design and execution on the part of Mr. Hunter, who has carried out the whole of the engineering arrangements.

"Few are aware of the enormous wear and tear in the manufacture of gas. The most expensive part is in the retort-house, where the retorts and part of the brickwork require to be altogether renewed about every other year; and when we consider the rapid destruction that is going on, the liability to accidents, the fact that not a single moment in the year must the gas be turned off from the consumers, that the manufacture must go on for 24 hours every day, night and day, throughout the year, that it is impossible to store during the winter more gas than what is consumed say between four o'clock in the afternoon and eleven at night, that sometimes there is not a half-hour's stock beforehand, and at times it is consumed at the burner within a few minutes after manufacture—bearing in mind all this, and the class of workmen to be dealt with, the care and the constant attention, together with the engineering, architectural, chemical, mechanical, and business capabilities required, we cannot consider the position of a gas manager otherwise than as an important and responsible one, requiring and deserving the support of the consumers, and a little more co-operation and charity than is usually given to such officials."

QUALITY OF GAS AT ABERDEEN.—Professor Brazier, of the University of Aberdeen, has just presented his quarterly report to the Town Council of that city on the quality of the gas. His report is as follows:—"As usual, at the close of another quarter, I have to report to you upon the illuminating power and purity of the gas, as supplied to the town of Aberdeen by the corporation. During the past quarter visits were made on Oct. 31, Nov. 21, and Dec. 28.

	1st Observation.	2nd Observation.	Mean.
Visit made Oct. 31, 1874 ..	30·03 candles ..	30·50 candles ..	30·27
Visit made Nov. 21, 1874 ..	31·26 ,, ..	31·39 ,, ..	31·325
Visit made Dec. 28, 1874 ..	30·30 ,, ..	30·33 ,, ..	30·315

The gas has been tested several times for sulphuretted hydrogen, ammonia, and carbonic acid, and upon no occasion could anything but mere traces of ammonia be detected."

AMERICAN GASLIGHT ASSOCIATION.

(*Continued from page* 23.)

Mr. LITTLEHALES: I would like to make one remark more. It seems that Captain White has still avoided one of the main points. He says that he is making gas one-third cheaper than it was made by his company before. I would not question him for a single moment. The chances are that before it was badly managed—there was waste; but that does not touch the question of oil *versus* coal. He says he has made large profits for the company, and that should be judged as one of the tests in favour of the naphtha process. To my mind it is a perfect farce. I may say that I am in exactly the same position, in reference to that, as Captain White. We are making gas cheaper, we are producing more, we are working with less retorts, and we are making more profits; that point, therefore, falls to the ground altogether. It does not touch the question. We want to know the value of oil *versus* coal, yet we do not know it. He says they are making it cheaper now than they used to; that is no point, because there may have been a great deal of mismanagement, and lots of things we do not know anything about; because he is now making it cheaper than before, does not touch the question.

Captain WHITE: I will say, in reply, that there is only one way for us to get at that. I know what the works in the city are producing per ton of coal; that is the only way for me to get at it. The works in the city of Brooklyn are managed by other gentlemen beside myself. There are six of us here. I think four out of the six are engaged in the manufacture of coal gas. They are four gentlemen second to none in our profession for ability. Now, I will take the results of their works, the yield per ton, the standard illuminating power, and cost of manufacture generally. I take that as a basis, and make an estimate upon it; and I assert that my claim still holds that I make gas cheaper than they do. I do say that the Citizens Gas Company and the Peoples Gas Company, making gas with the use of naphtha, do make and put in their holders a standard illuminating gas cheaper than other companies in the city are able to do. I say, my friend Captain Benson makes 10,400 feet of gas from a ton of coal. I know what it costs him, for I buy the same kind of coal. We make an estimate upon that. I know just as well as Captain Benson does how many men it takes to handle his works. I can judge fairly of all the material used, and of the rebate from the sale of residuals, so an estimate made up in that way gives us the cost of coal gas in the holders. Now, I will make the same quantity of gas, of say same illuminating power, or better, nearly one-third cheaper. My directors have called upon me to make estimates touching upon this very question, and the only way I can get at it is to say we make 600,000 feet of gas in a day; and making it in the old way, we can only say it will take so many tons of coal, so many retorts, so much purification, and labour proportioned to these large operations. Write these figures down, and say it costs you to put your gas in the holders one dollar, all credits allowed, and you cannot make it any less here. Now make the gas the way I do, and you use less coal and less labour, you use less purifying material, and have everything in your favour in point of wear and tear and repairs. As one-half or one-third of your gas is made from naphtha, which costs 4½ cents. per gallon, and a gallon will make 90 cubic feet of 60-candle gas, we make about 130 odd feet to the gallon, but of course that includes the diluent, of water gas.

Mr. NEAL: I have three questions I would like to ask. In the first place, what is the specific gravity of your gas, the weight of it as compared with ours? Second, if it is, as I understood, much heavier than our ordinary coal gas, are your consumers obliged to change their burners with large apertures? Third, has the consumption of a given number of consumers fallen off, by reason of this change giving them a heavier gas? I am told that it has, that their bills are not so large, and therefore there is not so much money coming into the treasury from a given number of consumers.

Captain WHITE: Those are questions that I am perfectly willing to answer. The gravity of our gas is certainly nearly ·130 heavier than coal gas of a similar illuminating power. Our gas averages between 525 and 600. That this does have an effect upon the consumption, there is no question. We estimate in our district there is about 2 to 3 per cent. loss in our consumption. The consumers through our district have, to a large extent, changed their burners; that was done a year ago, when we first commenced our experiments, and used the wrong process, when the gas was very heavy, and contained a large amount of air. I do not use in my own house burners of any larger openings than for ordinary coal gas. The results shown in our district now—and it is a bad season for us, the business houses are suspended from the dulness of the times—but our district shows a steady gain right along in the consumption, as compared with the same months of the past year. So that, while we do lose a certain per cent., we are still gaining something right along. The loss is small, and is to be considered as part of the cost. I have not been urging at all upon you the use of the naphtha gas alone. Gentlemen have said here that in using naphtha gas they lost the sale of residuals; that does not follow as we work.

Mr. NEAL: I did not refer to the falling off of consumption; but supposing to-day you send out the ordinary coal gas that you used to make, and a consumer burns 1000 feet, to-morrow you send out the gas that you are now making—will that consumer burn the same amount in a given time? That is the point.

Mr. WHITE: I was endeavouring to answer that. I do not think that he will burn within 2 or 3 per cent. as much as he did, and I consider that as part of the cost of the gas. If instead of selling a man 100 feet, you sell him 95, this 5 feet ought to be counted out of the cost.

Mr. SUTTON: Will your 16 or 17-candle gas be any different from the 17-candle gas of the Manhattan Company in New York?

Captain WHITE: No, I do not think it will. It will take the same burner; a 16-candle gas depends upon its containing certain constituents, in certain proportions; and it does not make any difference whether you put them in one way or another.

On the motion of Mr. LITTLEHALES, seconded by Mr. CATHELS, the committee were especially requested to investigate, and report to the association upon, the following points in reference to the naphtha gas process:—

"1. The cost per 1000 for material. 2. The cost per 1000 for labour. 3. The cost per 1000 for purification. 4. The cost per 1000 for wear and tear of retorts. 5. The cost per 1000 for gas at consumers meters, calculated on gas paid for. 6. The rates of wages. 7. Amount of capital required per million feet annual make, to construct works for naphtha, as compared to that for coal."

Mr. EDGERTON: There cannot be, of course, any detailed statement made here of the cost of naphtha gas, or of the mixture of the naphtha gas with other gases, at the price of labour and materials in all other localities. That is out of the question. Every individual has to investigate that with a view of knowing the prices in his locality. Now, I make this statement by which you can make such a calculation for yourself; if you visit the works and see whether the gas is successful, you can inquire the price of the materials, and you can apply those prices there to the prices as you find them at home. I state this again, that the equivalent in the city of New York, where one gallon of naphtha costs at present 2½ cents., made into a commercial naphtha gas, and distributed, the commercial equivalent, in coal gas of 15 to 16 candle power, is 400 cubic feet. In regard to the labour that it requires to make the naphtha gas, you have already had sufficient statements from Captain White, which show the amount that can be made per day. There is the foundation of the thing. You require one gallon of naphtha to make a commercial equivalent, in lighting power, of 400 cubic feet of coal gas. If anybody has made any experiment with naphtha gas that differs from this, I challenge the comparison. That, I say, is what I know upon this point. And I also further say, that four years ago, when this question came up, I applied to all the scientific ability in the country in regard to it; I applied, among others, to Professor Würtz, and in his report is contained the statement of William Farmer, of results of experiments made at the Manhattan Gaslight Company's works and this agrees materially, within a small per centage, with the statement I now make. I have the original of that report of Professor Würtz, and it is a report of facts that cannot be gainsaid. In applying and trying to find out the price of gas in your various localities, you want simply the fundamental data—that is, the quantity of gas made from a certain amount of material, the illuminating power of that gas, and the labour required to make it. The prices you have to apply in your own localities, at which you obtain the material. The prices made on the Brooklyn gas would not answer elsewhere.

Mr. HARRISON: There seems to be a difference of statements as to the equivalent of coal and naphtha gas, which is worthy of a little more attention. Mr. Edgerton states that the equivalent of one gallon of naphtha gas is 400 feet of coal gas. Captain White stated that he makes, from a gallon of naphtha, 90 feet of gas, which, diluted down to the quality of 16 or 17 candle gas, is 130 to 140 feet. Mr. Libby, the president of the gas company, states it about 130 feet. The difference between 130 feet, which is the equivalent obtained by the Citizens Gas Company from a gallon of naphtha, and 400 feet, which I understand Mr. Edgerton to state, is worthy of the consideration and the attention of the association.

Mr. EDGERTON: That point is well worthy of our attention, and I propose to explain that point. I propose to show that the difference between these results is very easily explained, for this reason, that I stated the commercial equivalent of naphtha gas, made from a gallon of naphtha, made properly in my opinion from the actual test of that gas, burned in suitable burners, without any admixture of anything whatever—that is naphtha gas. Now, Captain White's equivalent is based upon the mixture of other gases. As to those other gases, I have not understood their quantities, per centages, or illuminating powers. If I understood these, I might give as I have made in other cases, an estimate of the reduction of candle power, due to mixture with the various diluents, air, hydrogen, carbonic oxide, and various other gases. But the very moment you commence to introduce into the 400 cubic feet of naphtha gas the equivalent of 400 feet of coal gas, and made from naphtha—the moment any diluent is introduced, whether air or carbonic oxide—there is a change in the lighting power of that gas; of course you cannot get the same amount of light out of it. The estimated reduction can only be ascertained by experiment. If Captain White gets from a gallon 130 cubic feet of combined gas, and that 130 cubic feet of combined gas gives an illuminating power of 17 candles, then the combination has been at the expense of the petroleum gas, to the extent of 50 per cent. of the material. That seems clear and fair. Now this of course must be made the subject of a strict and careful investigation by the committee, and cannot be gone into detail here, but it is for them to work out, and to see how it is done. They will have no trouble, except to go to places where it is done, and see it done, or ask the people who do it how it is done.

Mr. LITTLEHALES: Are the results of Mr. Edgerton literal results? Are they the results of actual work?

Mr. EDGERTON: They are derived from the results of 22 gas companies, the practical running by the burning and consumption of 2000 consumers of the gas.

Mr. NEAL: I move that this subject be postponed to the next meeting. We are gasified and assified by the consideration of the subject, and as I am one of the committee who are to report, if I hear much more, as I said before, I shall be entirely in the dark. Therefore I move that the further consideration of the subject be postponed until the report of the committee at the next meeting.

The motion was put and carried.

Mr. G. A. HYDE, engineer of the Cleveland Gaslight and Coke Company, then read the following paper on

PURIFICATION.

At the last meeting of this association, held at Cleveland, I was requested, and I assented, to prepare a paper on the subject of purification, to be presented at this meeting. My friend who suggested my name, and myself, in assenting had in view the reporting of the results of a trial of the use of oxide of iron for purifying, as at that time our company had just commenced the use of it. Had I reflected a moment, I should not have assented to write on a subject of so much importance; as an intelligent paper on that subject, to be presented to a body of so learned and skilled gentlemen as this, should be written by a competent chemist, and I do not profess to be a chemist or the son of a chemist.

I will, however, make a statement of the composition of the purifying material we have used in our works during the present year and some of the results thereof. They will not, however, be as thorough or complete as they should be, as sufficient time has not elapsed to arrive at all of the results; and further, I have not, from a press of other duties, been able to give the time to the subject that I ought.

Previous to the present year our company has used the hydrate of lime for purifying, but the offensive odours arising from it, after being removed from the purifying boxes, induced a change to the oxide of iron, as the gases escaping from the iron while ventilating and reoxidizing, are less offensive than from lime.

The composition of the material used was one part iron borings, eight parts sawdust, and three parts of hydrate of lime; the mass saturated with liquid sulphate of iron. The mass is placed in the purifying-box in bulk, on a single layer of trays. When foul the mass is removed and spread out, and exposed to the atmosphere for reoxidation. The mass was found to purify more gas on each succeeding trial, until the iron was thoroughly oxidized.

The iron, sawdust, &c., in quantity sufficient to charge all the purifiers, and a surplus for changing, costs about the same as the lime used for purifying during a period of four months, and after is used without cost except for labour, which, including remass from the purifiers, ventilating, and replacing, is not far from the cost of slaking lime, and charging and emptying the boxes, with the same.

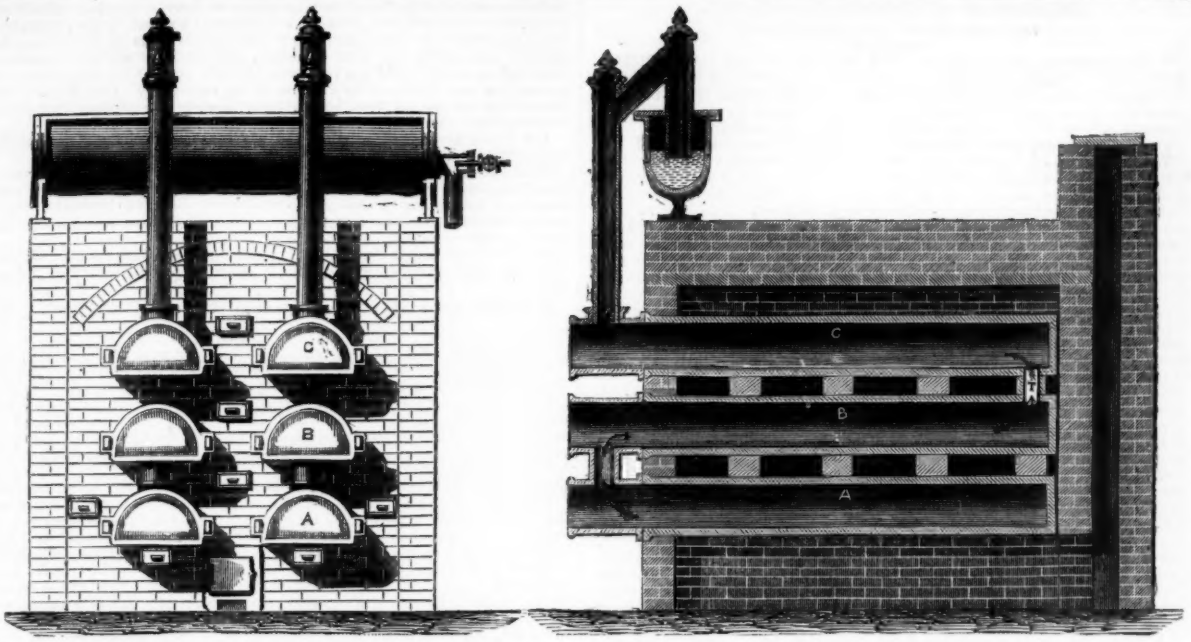
These statements of expenses are probably not new to most of you, gentlemen, but having been requested to present them, I do so with pleasure, as I desire to add my mite to the interchange of opinion on the great subject of gas-making.

The paper of Mr. Hyde having been received, the thanks of the association were voted to the writer.

NEW RETORT-SETTING.

Mr. CLEGG: If in order, I would like to request a statement from Mr. J. E. Condict, of New York city, on the subject of the manufacture of coal gas. We are full of petroleum, but I should like to hear something about the new system of making gas from coal alone, as now carried on at Yonkers.

Mr. CONDICT: I regret that the engineer of the works referred to—the Yonkers Gaslight Company—is not present here to-day, that he might read a paper which he prepared on the process now used at those works. If I had expected to bring this subject before the association, I would gladly have prepared a paper showing the manner in which the process is carried on. By referring to the diagram herewith presented, you can readily see how the new benches are constructed at Yonkers, and in what respect they differ from the old setting. I will not take up your time to go into any chemical analysis of this process, but simply state a few commercial facts, which may serve as a basis for your opinion as to the value of this system. A bench of six retorts was constructed, exactly as you see on the diagram, in September, 1873, and about the 1st of the following month it was fired up, and for nine consecutive months, without the intermission of a single hour, was kept in operation. The net results of using Westmoreland coal (with the exception of two tons of Murphy Run coal) in continuous running for nine consecutive months, averaged 12,000 feet of gas, of over 17-candle power, per ton of coal. After it had been working thus two or three months, the engineer of the



Yonkers company, Mr. Slade, came to our works in New York and made a test. A week later he made a second, and on the following week a third. These tests not only embraced all the matters pertaining to details of manufacture, the quality and permanent character of the gas, but also extended to every mechanism employed within or without the works, from the scales for weighing the coal, to the consumer's meters for measuring the quantity of gas sold. On his recommendation a bench was constructed at Yonkers. That bench, after running three or four months, and proving satisfactory, was followed by the changing of the entire works to this process. It is of interest to all of the stockholders in every gas company, and to every gas engineer, to know the simple fact that we can get 12,000 feet of 16 to 17 candle gas out of Westmoreland coal, as against 9500 feet by the old process. You will notice, by referring to the diagram, that it has a bench of six retorts. The three connected retorts on the right, and three on the left, form two entirely independent series, the lower and middle retorts of each side being connected by a stand-pipe, as shown in the drawing, and the middle and upper retorts in the rear, by an opening at the back end, through two saddle ties placed side by side. We charge all three of the connected retorts on one side of the bench simultaneously, and at the end of two hours the three on the other side, and the gas is worked off in the same length of time as under the ordinary process. The candle power was tested by three separate photometers, and found to average over 17 candles. We had another practical test. The gas was used in several large buildings, and one or two manufacturing establishments that used gas from other gas companies, and it was a common thing for us to go in these places, at the request of friends, and turn off our gas, and turn on the gas of other companies. Thus we had an option of comparing the illuminating power of our gas with that made by the old process, and the comparison fully justifies the assertion that gas made by this process was up to, if not exceeding, the standard of that made by either of the other companies. There is no loss in coke; we tested it again and again, and the average we found to be from 33 to 35 bushels of coke to the ton, and of fully the same commercial value as coke from the ordinary way. There is no extra labour involved on the part of the workmen. By the old process you make tar at the expense of the gaseous product. We make only about three to four gallons of tar to the ton, as compared with the old process of 12 to 15 gallons. During the nine months that the bench was in operation, and making during that time more than 6 million feet of gas, the retorts were not cleaned once, and they are as free from carbon (with the exception of a very small collection in the rear end of the upper retorts) as the day they were placed in the benches. The first bench constructed at Yonkers has been running six months, without the intermission of one hour, and has not been cleaned once. I throw out these facts that you may see the simple result from this manner of setting, and I shall leave to parties more versed in chemical affairs than I to give a reason why such results are obtained. I will go still further, and state that the Yonkers works, after they had run one bench three months, and experimented very carefully in regard to that bench as compared with the old works, decided to take down other benches that were nearly new and in good order, and reconstruct them on this plan, believing that they would save the expense of reconstruction (over 1500 dols.) in three months time. The result has proved that to be the case. The cost of building a bench of six retorts by this process, commencing at the foundation, is not as great as by the old. You notice in this two stand-pipes, and in the old you have six. To change a bench of the old retorts to this new setting is a matter of very small moment. I feel, gentlemen, that any improvement, coming from what quarter it may, that will add to the quantity of gas, keeping quality the same as it is now, is deserving of investigation. I should be glad to answer any questions from any one.

In reply to several questions, Mr. CONDICT said: We work by the same heat as by the old process. We find no obstruction whatever in the rear opening; the opening is from 12 to 14 inches in size, and has never been closed. We use the same exhauster as in the old works. The entire works, aside from the setting of retorts, is the same as the old process. We use the long ton in making our estimates. We have made as high as 14,000 feet during the nine months, averaging 12,000 feet, of 17-candle gas, without any enriching coal, and without a pound of coal (excepting Westmoreland) other than the two tons referred to of Murphy Run coal. I will mention one fact, that the Yonkers works have used only Clover Hill coal (which you know is inferior to Westmoreland), that cost them on the docks 6 dols. 50 cents a ton, and their gas to-day is a little too rich. They get over 11,000 feet from this Clover Hill coal, while we obtained 12,000 feet from the Westmoreland. A simple way to overcome the stoppage is to introduce a little jet of steam in the hydraulic-pipe or stand-pipe either. They are 9-feet retorts; they were 14 by 23 by 9 feet. We have turned our attention to the difference in the gas that has passed through other meters, and examined that question thoroughly, particularly so by the engineer of the Yonkers works, and there was a loss—a little rising of 5 per cent.—between the consumer's meter and the station-meter. We had no trouble with naphthaline. I have no doubt that naphthaline, generated in any pipe, can be easily got rid of by a little steam. The tar is not as soft as the tar ordinarily is, but it flows off easily. At the Yonkers works it flows through nearly 200 feet, almost level. No obstruction. The ordinary clay retorts cost about 55 dols. each.

This terminated the business of the association, as far as the reading and discussion of papers was concerned.

Several new members were elected, and it was resolved that the next half-yearly meeting should be held on the second Wednesday in May, 1875, in the city of Washington, district of Columbia.

Mr. M'ILHENNY said the object of these meetings was to stimulate the members of the association to excel in their profession. Apart from the special character of the gathering, there would be sufficient reason why this association should enlarge and become permanent, and, if he might allude here to the facts, a year ago it came very near dying a natural death, but now the evidences are that it is on a permanent basis, and will remain so for some time at least. Questions of differences of opinion as regards changes or improvements, or whatever they may be, in the manufacture of gas, had nothing to do with the permanency of this organization, and he hoped, therefore, that all the gentlemen present, and as many more as would come, would visit Washington in May, and if he was there and alive and well, he would endeavour to extend to them as cordial a greeting as he possibly could.

Messrs. M'Ilhenny, Cartwright, and Nettleton were appointed a committee of arrangement for the meeting in Washington.

SLADE'S AUTOMATON FIRE-GOVERNOR.

Mr. STEBBINS: I want to introduce to the favourable notice of this association a regulator or steam-governor, which is now partially in use—a steam-governor that Mr. Nettleton has in use, and others have them—and I would like him to make a statement in reference to it, if it is in order. It is of great practical value to every gas company.

Mr. NETTLETON: I suppose Mr. Stebbins must refer to Slade's automaton fire-governor. I use one to regulate the fire, and that regulates the exhauster. I will say this, that since I used it my fuel goes 50 per cent. further than it did before. It does its work well. You fill up the fire-box with fuel, and it takes care of itself. I have no interest in it, except as I use it.

Mr. STEBBINS: It is a very inexpensive article, and is the invention of a man at Yonkers; and some of you gentlemen will go doubtless and see the way of making gas that has been mentioned by Mr. Condict, and you will see that at the same time.

Arrangements having been made for printing the transactions of the association in a book form, it was resolved that the thanks of this association be presented to the treasurer, Mr. De Mill, and that the 100 dols. already appropriated to him is to be received by him for compensation for his services.

The CHAIRMAN of the committee appointed to examine into the financial condition of the association reported that the committee examined the books and the accounts of the association, and found them correct.

It was resolved that the treasurer's report be published in the proceedings.

A vote of thanks was given to the *American Gaslight Journal*, for the courtesy received from the proprietors in publishing the proceedings of the association.

On the motion of Captain WHITE, a vote of thanks was presented to the president, for the able and dignified manner in which he had presided over the association.

The PRESIDENT: I shall be most happy to see you in my works in the city of New York, and I shall be happy to see you at my house or at my office. The works and books of the Manhattan Gaslight Company are open to your inspection. I now declare this meeting adjourned to the second Wednesday in May, at 10 a.m., in the city of Washington, district of Columbia.

[We are indebted to our contemporary, the *American Gaslight Journal*, for the very able report of the proceedings at this meeting, which we have published almost *verbatim* as it appeared in its columns.—ED. J. G. L.]

TUNBRIDGE WELLS GAS SUPPLY.—At the monthly meeting of the Improvement Commissioners on Wednesday last, the Gas Committee appointed to watch the parliamentary proceedings of the gas company reported that on the 14th of December last the clerk was supplied with a copy of their new bill, with the usual form for expressing assent, dissent, or neutrality with respect to the bill. The committee, as a matter of precaution, recommended the board to express dissent to the bill. They had examined its various provisions, and communicated to the company certain objections they felt it their duty to take on behalf of the town. The committee were also of opinion that a clause should be inserted in the bill binding the gas company to remove the present gas-works within a reasonable time, and to prohibit them introducing any new works for the manufacture or storeage of gas within the limits of the local Act district. In reply to that letter, one had been received expressing the willingness of the company to consider all the objections the board may make. This report was adopted, on the motion of Mr. Browell, who explained at some length the objections the committee had to the powers the gas company sought to obtain. A memorial was read complaining of the very bad gas the gas company had supplied the town of late, and the subject was referred to the Police Committee.

BIRMINGHAM (CORPORATION) GAS BILL.

THE ATTITUDE OF THE OUT-DISTRICTS.

OLDBURY.

A Public Meeting of the Ratepayers of Oldbury, convened by the Oldbury Local Board of Health, was held on the 2nd inst., to consider what steps should be taken to protect the interests of the ratepayers with respect to the bill proposed to be promoted in the ensuing session of Parliament by the Birmingham Corporation—Mr. B. T. SADLER, chairman of the local board, presided.

The CLERK having given an outline of the various provisions of the bill,

The CHAIRMAN said the question of the proposed measure had been fully investigated by a committee of the board, and they had decided that it would be desirable to get an amicable arrangement with the Birmingham Corporation which would be satisfactory to the ratepayers of Oldbury. A deputation from the board accordingly waited upon the mayor and other representatives of the Town Council. The deputation failed to obtain the consent of the mayor to Oldbury being allowed a representative on the board of management of the gas-works; but the mayor assured them that it was possible for the inhabitants of Oldbury to purchase their portion of the undertaking. From information supplied by the mayor, he found that the total annual consumption of gas manufactured by the companies whose works were proposed to be transferred was 1400 million feet. Of this total, the amount consumed in the township of Oldbury was 1-45th, or 31 million cubic feet. Oldbury would, therefore, have to raise that proportion of the whole cost of the undertaking. He had ascertained that the value of the mains, together with the plant, was about £35,000. This was the highest estimate afforded by three valuations of the works. The principal could be borrowed at the rate of 4 cent., yielding an annual interest of £1400. He said nothing about the reduction of the annual charge for interest by gradual redemption of the principal. The gas supplied to Oldbury, estimating it at 31 million feet, amounted to £5425, at the present price of 3s. 6d. per 1000 feet; and the proceeds from the sale of coke and other material would raise the receipts to about £6300. With regard to the expenditure, he proposed to deal with a 50 years purchase at £700 a year, which would give £2100, with the interest, while the manufacture of the gas, at 2s. 3d. per 1000, would realize £3487. Allowing £262 for depreciation of plant and losses, and £500 to be handed over to the funds of the town, the expenditure would be brought up to £6350. Alluding to the manufacture of gas, he found that a neighbouring corporation had fixed three prices for their gas—viz., 2s. 5d., 2s. 3d., and 2s. 1d. per 1000 feet, and he knew, from the best authority, that they derived a profit of 10 per cent. The average price of gas in the town to which he referred was 2s. 3d per 1000 feet, while in Oldbury they were paying 3s. 6d. per 1000. Taking another town (Bromsgrove), which was an extreme instance, the railway and canal being upwards of three miles distant, and with a population of only 7000, the cost of the manufacture of gas was only 2s. 8½d. per 1000 feet, whilst they realized 5s. 10½d. from the sale. He was told that the cost of the manufacture at Walsall was less than 2s. per 1000, but basing their calculations upon a cost of 2s. 5d. per 1000, that would give a sum of £3780. In Oldbury they had great facilities for the manufacture of gas, having coal in their own locality, and also convenient railway and canal communication, whilst the Birmingham Corporation would have to be supplied with coal from a distance. He thought that if the Birmingham Corporation could make a profit out of the gas, it was possible for the people of Oldbury to do likewise. His own opinion was that the manufacture of gas could be worked with profit and advantage to the town. They had not, however, now to decide upon the question of the purchase, but as to whether they should oppose the bills in Parliament with the object of getting protective clauses introduced therein. He reminded them that the surrounding towns were all resolving upon opposition, and he thought the people of Oldbury would not be behind those of neighbouring towns in endeavouring to protect their own interests. In conclusion, he pointed out that Oldbury was more favourably situated with regard to the purchase of the mains than other towns, for the mains running through Oldbury formed merely a branch of the system, and could easily be severed, whilst West Bromwich, on the other hand, formed the centre of the system, as the mains running through that town communicated with Birmingham itself.

The CLERK explained that the consent of the townspeople was necessary before any action could be taken by the local board. As a ratepayer, he was in favour of Oldbury manufacturing its own gas; but that was a question for future consideration, and the ratepayers would have to be again consulted before any money could be borrowed for the purpose.

After some discussion, a resolution was unanimously adopted, on the proposition of the chairman, empowering the local board to oppose the various bills.

SMETHWICK.

A Meeting of Ratepayers was held on the 4th inst. to sanction the opposition proposed to be made by the Local Board of Health to the above bills in the ensuing session of Parliament. The meeting was convened by Mr. A. Kean, the chairman of the local board, in reply to a requisition from the ratepayers.

The CHAIRMAN, in introducing the business of the evening, pointed out that the local board could take no steps in opposing the bills until the sanction of the inhabitants had been given in public meeting. The Board of Health believed that opposition to the bill was necessary to be made to protect the interests of the people of Smethwick. They were also of opinion that it would be wise for the ratepayers to have the power to erect their own gas-works and manufacture their own gas, at the proper time, and therefore they wished a clause to be inserted in the bill of the Birmingham Corporation empowering them to make the gas themselves if the Birmingham Corporation did not supply it at a reasonable rate. It was not their intention to offer any opposition to the corporation buying the gas-works, but merely to get protective clauses introduced into the bill.

Mr. S. J. AINGE asked if any estimate could be formed as to the probable expense of the opposition?

The CHAIRMAN replied that he was not yet in a position to give reliable information. He proceeded to say that he had waited upon the Mayor of Birmingham to ascertain his views with regard to the supply of gas to Smethwick, and they clearly saw that the corporation would get all they could. The Mayor of Birmingham had told him that the corporation proposed to make a profit of £20,000 per annum. He (the chairman) only desired that the ratepayers would give the board power to prevent the mayor making a part of that profit out of Smethwick.

Eventually a resolution was adopted on the motion of Mr. AINGE, seconded by Mr. COX, authorizing the board to oppose the various bills.

BALSALL HEATH.

At the Meeting of the Balsall Heath Local Board on Wednesday last—Mr. BRIGGS in the chair,

Mr. NETTLEFOLD said he wished to ask the board whether they had taken into consideration the effect which the Birmingham Corporation Gas Bill would have upon their district, and whether they would like any explanation as to what steps the large consumers in Birmingham were about to take in order to obtain clauses to limit the profit which the corporation could make upon the gas.

The CHAIRMAN said the board would be happy to hear any explanation, but they had the impression that Parliament would sufficiently protect them.

Mr. NETTLEFOLD said that the present gas companies were limited to a certain amount of dividend, and that was a sufficient protection to consumers; but according to the corporation bill the corporation were not to be limited. There was a limit with regard to the maximum price, which was really no limit whatever, because the maximum price had not been reached at all, and it was one-third more than the companies were charging. It was, therefore, really no protection whatever for the consumers against an increase of price. He directed attention to clauses 19 and 20 of the bill, and read a report by the committee of the gas consumers in Birmingham, in which the provisions of the present Acts and the corporation bill were explained. He said that all the consumers in Birmingham wished to do was to obtain clauses to prevent the corporation from making too large profits at the expense of the ratepayers. They did not mind whom they had the gas from, but they simply wished to obtain a limit similar to that placed upon the present gas companies.

The CHAIRMAN asked whether the gas consumers whom Mr. Nettlefold represented wished the board to join with them.

Mr. NETTLEFORD said that unless there was some opposition the corporation would have their bill passed in its present form. He thought the local board should act independently, and get the ratepayers consent to oppose the clauses he had referred to, and he also thought it would be desirable to get a petition signed by the ratepayers.

Mr. ARCHER said that they had a large number of consumers in Balsall Heath.

Mr. NETTLEFOLD said, that being so, it was an important matter for them to consider.

It was then resolved to have a special meeting to consider the matter.

LONGTON GAS SUPPLY.

PROPOSED PURCHASE OF THE GAS-WORKS BY THE CORPORATION.

The Monthly Meeting of the Longton Town Council was held on the 7th inst.—the MAYOR (Mr. A. Edwards) presiding.

A report was brought up from the Gas Contract Committee to the following effect:—"The committee deem it advisable that an effort be made by the council to negotiate for the purchase of the Longton Gas Company's undertaking, for the benefit of the town, and the committee recommend the council to take the necessary steps to oppose the proposed bill for empowering the Longton Gas Company to extend their limits of supply, and for other purposes."

Alderman GODDARD, in moving the adoption of the report, said it was through the mayor having called his attention to the notice given by the gas company of their intention to go to Parliament that the subject had been brought before the committee. He had duly considered the responsibility, and weighed all the consequences which his motions involved, and he believed there was no alternative than that the council should, on behalf of and in the interest of the ratepayers, oppose the gas company's bill. He was also strongly in favour of purchasing the gas-works for the town. He recommended opposition to the bill, not from any hostile spirit, but as the only means by which there was hope of making better terms with the gas company than the existing terms. In looking through the report of the gas company, he found that they had been very prosperous, and he congratulated the shareholders upon that, for he did not grudge them one fraction of the dividend they had obtained—they were fully entitled to it, but he did complain that the ratepayers—the gas consumers—had not received benefit from the £3000 or £4000 surplus which should have been appropriated as the Act provided. During 1871, 1872, and 1873 the company had been highly prosperous, and had paid not only the dividends upon the old and new capital, but had paid the arrears between 1866, when the company was formed, and the year 1871. There were some good men amongst the directors—men of business, tact, and energy—and they had prepared a plan for extending their mains to Barlaston and Blyth Marsh. If fresh capital were issued he supposed it would be devoted to paying any deficiency that might arise in the speculation of taking gas to Barlaston and Blyth Marsh, and so in their time, at least, they could not hope to see any reduction in the price of gas at Longton. He submitted that it was the duty of the council to oppose the bill, both for their own protection and for the protection of those who should succeed them.

Mr. ADAMS seconded the motion, and said he believed the directors of the gas company had discharged their duty well, and to the general satisfaction of the burgesses, by reducing the price of gas from what it used to be. He thought their next duty was to give to those who had made their good position for them some further advantages. The town got good gas, but they had to pay a good price for it. [The price of gas at Longton is 3s. 6d. per 1000.] Although the gas company, in the earlier period of their history, had difficulties and losses, they had got through them all, and the time was now come when he thought the council had a right to ask respectfully that the position of the town as to the gas supply should be considered. He should be sorry for money to be wasted in opposing the gas company, and entering upon a legal squabble which would yield no good return; and he thought the proposition of the Gas Committee was a courteous and proper one, which would be favourably entertained, and that the directors would feel it to be their interest, as it would be their pleasure, to sell the gas-works to the town.

Alderman BARLOW said that some years ago he was one of the committee appointed to ascertain upon what terms the gas-works could be sold to the town, but the views of the committee and those of the directors were so wide that the negotiations fell through. He thought it would be the wisest course for the committee to purchase the gas-works rather than rush into litigation; and he did not think the gas company would be so far forgetful of duty as to expend profits in giving the benefit to outlying districts. He hoped that the handsome profits which the gas company realized would be given back in some proportion to the people of Longton in the shape of a reduction in the price of gas. He felt sure this matter only wanted going about in a fair and amicable spirit; and the gas company, who were men of business, some of them large ratepayers and interested in the welfare of the town, would meet the corporation in a right way. He, however, fully thought the council should place itself in such a position as to have a *locus standi* in opposing the company's bill, if it were found needful.

Alderman HULSE thought it would have been better if Alderman Goddard had not been so free in his remarks, for there was not a particle of truth in what he alleged as to the objects and intentions of the gas company by their bill. The company had been pressed to extend the mains to Blyth Marsh, but they had refrained from doing so until they were satisfied that they should get paid for the outlay.

Mr. WELCH entirely endorsed the remarks of the mover and seconder and maintained that undertakings of this kind should not be carried on as a matter of personal profit, but that gas and water works should be in the hands of the people. The Legislature showed the same view in providing that only a certain per centage of profit should be allowed to the gas companies. He thought the deductions of Alderman Goddard as to the motives of the gas company for making the proposed extensions were reasonable. He found that the company had not really made any reduction in the price of gas.

Mr. HAWLEY reminded the last speaker that the company were charging 6d. per 1000 cubic feet less for gas supplied to the public lamps than they were empowered to charge.

Alderman BARLOW said it was also due to the company to state that, when coal advanced so much in price, the company listened to representations made to them, and did not increase the price of gas.

Alderman GODDARD said the following figures would be the best answer to that:—In the half year ending June, 1870, the gas company paid £642 16s. 10d. for coal, and there was realized from a sale of products £309 12s. 6d., so that the actual cost of coal was £333 4s. 7d. The gas-rental was £2863 9s. 4d, and a dividend of 10 per cent. upon the old shares and 7 per cent. upon the new was paid. No arrears were paid. In the corresponding half of 1873, however, when coal was dearer, they paid for coal £1318 17s. 11d. But they received for products £1175 19s. 1d., so that the coal actually cost less than in 1870. The gas-rental was £3169 13s. 2d., and besides the per centage payment,

10 per cent. upon old and 7 per cent. upon new shares, there was £419 of arrears paid. Although that year the price of coal was higher, the company made a better net profit than in 1870.

Alderman HULSE remarked that, by the exercise of a little of the foresight and prudence for which the directors were given credit, they made contracts for coals before the rise took place, and had all the advantage of the subsequent advance in the value of coke. The company did not propose to ask Parliament for more capital, They had £5000 not yet called up, and that would be appropriated to the extensions.

The MAYOR observed that there was unanimity of feeling amongst the committee as to purchasing the gas-works, but it was thought better for the council to place themselves in a position to oppose the company's bill should it be found necessary.

The resolution was then put to the meeting, and carried with one dissentient.

MANCHESTER (CORPORATION) GAS SUPPLY.

At the Meeting of the Manchester Town Council, on the 6th inst.—the MAYOR (Alderman King) in the chair,

Mr. BAKER called attention to recent deficiencies in the supply of gas. He also asked whether the time had not yet arrived when the Gas Committee ought to erect new works. He was told on competent authority that whenever there was an unusual demand for gas, the consumption was in an enormous degree greater than the production. That was a state of affairs which ought certainly not to exist.

Alderman BENNETT fully endorsed all Mr. Baker had said about a short supply of gas, and the complaints made by the ratepayers as to the proceedings of the Gas Committee; but he reminded the council—and he was not on the Gas Committee—that it was not the fault of the Gas Committee, but the fault of the council. The Gas Committee had looked ahead some time ago, and had bought a considerable quantity of land on which to erect new gas-works, and if the council had allowed the committee to go on with the works, they might have had a larger supply of gas than they had now.

Alderman GRUNDY said it was for the council to consider whether the time had not come when they should reconsider their decision as to the erection of new gas-works. From conversations which he had had with several members of the council, he believed the council would now arrive at a different conclusion to that adopted on the previous occasion.

Alderman MURRAY said when the question was previously considered, the council (in refusing to sanction the erection of new works) had acted from the conviction that the Gas Committee had taken upon themselves (without the approval of the council) to purchase a site of ground, and to pay for it, and then to ask them to ratify the purchase.

Mr. STEWART believed that the reason the gas was so defective was that about 100 of the workmen employed by the committee were absent from work. He trusted that if new gas-works were required, they would be erected somewhere beyond the city boundaries.

The MAYOR (as chairman of the Gas Committee) explained that the deficient supply of gas on the Monday following Christmas-day was attributable to the very small amount of work done by the gasmen on the three previous days. There was no question about wages, as had been suggested in the matter. On Christmas-day the men did less work than they ordinarily did on a Sunday. The Saturday following was an ordinary working day, and they ought to have been able to fill all the gasholders; but on that day at least 100 men stayed away from their work, and the manufacture of gas was less than it was even on the following day, when the production was less than the Sunday average. The consequence was that they started on Monday morning with only 1,250,000 cubic feet of gas stored instead of 6 millions, and the darkness on Monday was so great that the consumption of gas beat the production, and although everything that could possibly be safely done was done to force the production of gas on that day, the reserve when the evening began was down to 1 million cubic feet. The consumption of gas this winter had on some days been greater than the average production. On several days in December the consumption had gone up as high as 11 million cubic feet, whereas the maximum production at the gas-works was only a little over 10 million cubic feet.

GAS EXPLOSION AT DURHAM.

As briefly noted in our last, a serious and fatal explosion of gas occurred at Durham on Saturday, Jan. 3, the source of which has been discovered in a fracture of the main-pipe supplying the locality. It appears that at this particular spot the gas-pipe crosses the main drain. The drain is at a depth of 18 feet, and the gas-pipe at a depth of about 3 feet. When the drain was placed at such a depth it was necessary to insert some strong cross woodwork to keep the earth from falling in. This woodwork is generally taken out in work of this description; in the present case, however, from some cause or other the woodwork was allowed to remain. Close underneath the props the gas-pipe was laid, and the weight of the earth above the props appears to have broken the main, making an aperture for the escape of the gas about 6 inches long and an inch in depth.

The explosion took place about five o'clock in the afternoon of the day in question, and resulted in the almost total destruction of the house of Mr. J. Gray, a tailor and draper, and the death of two of his children. For a day or two previously a smell of gas had been perceived in several of the houses, and it became so bad on the Saturday that a person was sent to the gas company's office to give notice of the existence of an escape, and to require attention. A man named Arckless, the company's foreman, accordingly went to the place and examined the service-pipes and meter in Mr. Gray's house, which were found to be all in good order. A further search was made, and it was found that gas was escaping from the main-pipe in the street, and finding its way through a grating into the house. Arckless, however, does not seem to have apprehended serious results from such a state of things, for he informed Mr. Gray that, the company's men having ceased work for the day, the damage could no be repaired till Monday, advising him meanwhile to keep his doors and windows open. About half-past four o'clock Mr. Gray lighted the gas in his shop, and very shortly afterwards the explosion occurred, the immediate effect being that the shop window was blown out, as were the windows in two rooms upstairs, whilst the goods in the shop and furniture were more or less damaged, and the shop was set on fire. At the time of the accident there were in the house Mr. Gray, who with his two children, Robert, aged four, and Henry, aged two-and-a-half, were with him in the shop; and Mrs. Gray, who was only confined about a week previously, being in bed upstairs. Mr. Gray was almost blown out of the shop, and became insensible. His two children were both very much injured, and with their father were carried to the County Hospital. The father was much injured about the face, and besides a general shock had a contused ankle. The elder of the two children bore no external marks, but the whole of the body was discoloured. He died from his injuries at three o'clock on Sunday morning. The other child had a severe scalp wound and a broken thigh, and died soon afterwards. Mrs. Gray and her baby escaped by a mere accident. Some persons, who were near the spot at the time of the explosion, rendered every assistance in removing the sufferers and extinguishing the flames. Mrs. Gray was carried downstairs, and, with her infant, was transferred to a house near. The explosion broke all the windows of a house on the opposite side of the road. Within an hour after the above accident a second explosion took place in a house on the same side, but a little lower down the street. Mrs. Martin, who occupied it, called the attention of Mr. Summers, the secretary of the gas company, to the quantity of gas in her house. He, accompanied by a man named Smurthwaite, went in the cellar to examine the meter. Mr. Summers carried a lighted safety-lamp, but on reaching the meter he very incautiously struck a match, and the consequence was an explosion. The meter was blown to the opposite side of the cellar, and with it Mr. Summers and his companion, both of whom were injured, but not seriously. They were taken to the County Hospital. The damage done to the lower part of Mrs. Martin's house is considerable.

On Tuesday, Jan. 5, an inquest was held at the infirmary, by Mr. John Graham, the coroner, on the bodies of the two children of Mr. Gray.

Mr. CHAMBERS appeared for Mr. Smith, the owner of the property, and for Mr. Gray, the occupier; and Mr. J. PATRICK, sen., attended to represent the Durham Gas Company.

After viewing the bodies of the deceased, the jury proceeded to inspect the scene of the explosion.

Mr. PATRICK said he wished, with the permission of the coroner, to state that he appeared there on behalf of the City of Durham Gas Company to watch the proceedings; and he might say that, in common with the coroner, and with everybody else, they regretted very much the unfortunate occurrence. They felt, however, that it was a matter quite beyond their control, and they courted every possible inquiry; and he was authorized to state on behalf of Mr. H. J. Marshall, the chairman of the company, and Mr. John Burdon, one of the directors, who was present, that they would give every information that could facilitate the inquiry, and enable the jury to arrive at a satisfactory conclusion as to the cause of the sad affair.

The first witness examined was Mr. *Gray*, and his evidence was taken in the ward in which he lies. He said about noon on Saturday, the 3rd inst., his sister-in-law, Hannah Clark, called his attention to an escape of gas in his front shop. He thought there might be an escape from the meter, and told her to turn the gas off there. A few minutes later Mr. Smith, the landlord, went to his shop about the escape. He found a smell of gas in the front shop, and went to the meter, which was turned off. He lit several matches, and tried the fittings, but did not discover any escape. At two o'clock Arckless, the gas company's foreman, went and said, after examining the premises, "It must be coming from the main," and afterwards, on going to the front, he said he could smell it coming out of the drain. Arckless did not go into witness's shop or house to make any examination, nor did he ask to do so. Mr. Smith asked Arckless to look after the gas-pipes, and he said it was a very awkward time as the men had all gone away, and added, it would be done on Monday. Arckless advised him to open all the windows, and said they would just have to try and manage until Monday, and went away. At four o'clock he saw Mr. Summers, the secretary to the company, in his front shop, who said, "You have got a bad smell here," and witness replied, "I am sure it is from the main, because Mr. Gowland's house is worse than my own." Mr. Summers went into Gowland's, and said it was very bad, and that it was a pity Arckless had not commenced at once, but it was too late in the day then. Witness said, "Could it not be done by lamp fire?" and added that there was no harm in working on a Sunday in a case of that kind. Mr. Summers replied, "Well, I do not know what to do; men are so bad to get." At ten minutes past four o'clock witness lit two burners, and went into his wife's bed-room, and then returned to the front shop, to which he was followed by his two children, now deceased. Being anxious to discover where the escape came from, he took a light to the corner of the shop, when the explosion took place, and he remembered no more. Mr. Summers did not suggest to him to be very careful, but he said no doubt it was dangerous. He did not warn him to have no lights in his shop.

Mr. *G. Smith*, the owner of the property, proved going to the gas-works about two o'clock, and seeing Arckless. The reason he went to him, instead of the office, was that he believed it was the proper place to go to to get men to look after the escape, as he thought he could get it done more readily. He told Arckless there was an escape of gas about the premises, and asked him to get some men. Arckless went up and examined the place, and said the escape was from the main, and, as the men had left work at one o'clock, nothing could be done until Monday morning. Arckless thought there was no danger so long as the gas had liberty and mixed with the air. Gray said to Arckless, "If you leave it until Monday, and anything happens in the meantime, the gas company will be responsible." Witness did not know whether Arckless made any reply.

After hearing some corroborative evidence, *Benjamin Arckless* was called. He said, I am foreman in the employ of the Durham Gas Company, and live at the works. I have been in the employ of the company nine years, and have been foreman during the last five. During the previous four years I did the blacksmith work—that being my business—and was employed in putting service-pipes in the city for the company. I did not put in the service-pipes in Mr. Smith's house, nor did I see the work done. Mr. Smith came to me at the works about a quarter past two on Saturday afternoon, and told me there was a smell of gas in the house of one of his tenants named Gowland. I went with him to the house, and saw Mrs. Gowland, who told me there was a great smell of gas in the front room. She opened the door, and I went in. I smelt a good deal of gas. It was stronger than I had ever smelt it at any private house where there had been an escape from the fittings. Mr. Smith informed me there were no service-pipes in Mrs. Gowland's house. I then concluded the escape must be from the main outside. Mrs. Gowland asked me what could be done. I replied I could not tell at that time, as it was getting late to break up the street; that the men had left work at one o'clock; and that I did not know where to find them, even if I went in search of them. I told her I thought there would be no fear of any danger if she kept the front-room door shut, and the windows and doors leading into the street open. At Mr. Smith's request, I examined his service-pipe in the back part of the premises. I found it all right. That pipe was the same as supplied Mr. Gray's premises with gas. Mr. Gray came up at this particular time, and said, "What are you going to do, Arckless? Are you going to blow us up, because if you do the company will have to pay for it?" As he said this in a jesting way, I took it as such. I did not tell him what I was going to do. Mr. Smith said, "The smell is in Mr. Gray's, we had better go in there." Mr. Gray, who was present at the time, observed, "It is no use going in there, it is in Mr. Gowland's, and we had better go there." I said I had been there. He then asked me what I thought about it. I remarked, "It is bad," but that I had ordered Mrs. Gowland to keep the front room door shut, and the other door and windows open. Mr. Smith, Mr. Gray, and myself then went to the grate. I knelt on my knee and smelt at the grate, and found gas coming from it, but the smell was not so strong as it was in Mrs. Gowland's house. I said I thought the escape came from the main. Mr. Gray inquired what I was going to do. I replied we could not do much, as it would be dark directly, and we had no men, they having left work at one o'clock, and that I would see about searching for the escape first thing on Monday morning. I do not remember the reply Mr. Gray made. I then went to the office in Silver Street, and saw Mr. Summers. That would be about ten minutes after three. I told him there was a bad smell of gas in Mr. George Smith's property, in Atherton Street, and that I should like him to call and see what he thought about it, as there was no service-pipe in, and that the escape came from the street. Mr. Summers said I might try to get some men to search for the escape. Of course I understood him to mean to break up the street to get at the main. I told him I could not get any men at that time, and even if I could it would be dark before they started. Mr. Summers then said he would call himself.

In the course of his further examination, *witness* said he, as foreman, had authority to search for escapes of gas without first consulting Mr. Summers.

His difficulty lay in getting men together on the Saturday afternoon to do the work. There was no list kept by him of the residences of the men, that they could be found on an emergency, but he believed the secretary knew them. The men who were then at work at the retorts were not fit for out-of-door work. After the explosion he sent a lamplighter to find the men, and he found them. Witness did not know where the lamplighter lived, but he met him by accident on the night in question. The main which was fractured was laid down before his connexion with the company. The drain beneath it was put in about three years ago. He did not know whether any one superintended the operation on behalf of the gas company. The fracture in the main was discovered on the Monday. There were 14 men at work then. There was only one valve in the mains, and that was at the works. If anything went wrong in the town, there were no means of cutting off the gas.

Mr. *John Summers:* I am secretary of the Durham City Gas Company. I have held the office 10 or 12 years. The 5-inch main on the North Road has not been laid since I have been a servant of the company. I believe it is somewhere about 15 years since it was laid down. On Saturday last between three and four o'clock in the afternoon, Arckless came to the office and told me that Mr. Smith had called upon him, stating that there was an escape of gas in Mr. Gowland's house. He did not state where he thought the gas came from, nor did he give any opinion upon it. I think Arckless said that Gowland's house had no service-pipe in it. No conversation took place between us as the place where the escape came from. I, of course, knew that no gas was laid in Mr. Gowland's house. I did not at the time form any idea as to where the gas came from. I told Arckless that if there was any escape of gas he had better start at once with it. Arckless replied, "I have arranged with the parties to keep their doors and windows open till Monday, and I think all will be right till then," and that he had told Mrs. Gowland to keep out of the front room till then." Of course I understood from that that everything was settled between him and the parties in the houses. The interview then ended. I did not tell Arckless to seek his men out. I called at Gray's as I went past, a little after four o'clock, and saw a young woman, and said to her, "You have an escape of gas here." She replied, "Yes, we have." Nothing further passed between us, because I was invited to go into Mr. Gowland's house, where it was said the smell was worse. I went into Mr. Gowland's house, and saw that there was gas in the front room. I said, "If you keep the windows open and the door shut, I think you will take no harm." I did not say that it was a pity the men did not start. Something was said about Arckless having been there, and I said I wished him to start with it. When I was at Mr. Gray's I should not have demurred to lighting the gas although there was a smell of an escape.

Witness detailed the facts of his search for an escape after the first explosion at Mrs. Martin's house, and of his having been knocked down insensible from the second explosion while in her cellar. He said that during the time the corporation were putting down the drain in Atherton Street beneath the gas-pipe no one watched the progress of the work in the interest of the gas company. He received no notice of the intention of putting down a drain.

William Gibson, a mason, deposed to finding the deceased children beneath the *débris*. Mr. Brunton, city surveyor, and witness measured the distance from the fracture in the 5-inch main to Mr. Gray's shop door, and found it to be 48 feet. The main was laid parallel with the curb-stone, about 14 to 18 inches distant. The main was in 9 feet lengths. In a line extending about 50 feet, or about five and a half lines of 5-inch main, the depression at the point of fracture, which occurred 3¾ inches from the joint (being three lengths from the high and two and a half from the low end) was 10 inches to the top of the main. Below the joint, about 13 inches of wooden stay, which had been put in while making the drain, was pressing close down upon the top of the main, which was at that point about 2 feet 6 inches below the channel.

By Mr. CHAMBERS: The sewer is from 17 to 18 feet deep at that point, and the soil is very loose and mixed with water at the bottom. About 8 feet of forced stuff or made earth was on the top. The stay had no support except resting on the main.

Medical evidence having been given as to the nature of the injuries resulting in the deaths of the children,

The CORONER summed up. He said no doubt the foreman of the gas-works had given his evidence in such a manner as might tend to screen him from any blame that might attach to him. Although questions in connexion wth this unfortunate occurrence might hereafter arise for solution in civil courts, the jury had nothing to do with them. All they had to consider was whether the deaths of these poor children had arisen from any act or negligence for which some person or persons were responsible. He thought they would agree with him that there was no evidence fixing criminal culpability on any one. That being so, they might dismiss from their minds the idea of charging a person with manslaughter, and that they would be justified in finding a verdict of accidental death in consequence of injuries received from the explosion of gas. If they thought it right to append anything to that verdict he would forward it to the proper quarter, where no doubt it would receive every consideration.

The jury, having consulted for three quarters of an hour, returned the following verdict:—"That the deaths of Robert Gray and Henry Clark Gray were caused by an explosion of gas which escaped from a fracture in a main-pipe belonging to the Durham Gas Company. The jury further believe that the fact of a considerable escape of gas taking place had previous to the explosion come to the knowledge of Benjamin Arckless, foreman, and John Summers, secretary to the gas company, and they are strongly of opinion that if prompt and decisive measures had been adopted the explosion might have been averted. The jury are also of opinion that the safety of the public would be greatly promoted by the Durham Gas Company providing in the principal streets of the city stop-valves in connexion with their mains."

The CORONER, in closing the proceedings, said: I am glad you have added to your verdict the remarks I have just read. I fully concur in every word. I certainly was astonished to hear in the evidence Arckless has given that there was no street-valve except the one at the works.

The inquiry terminated at ten o'clock at night, having lasted nine and a half hours.

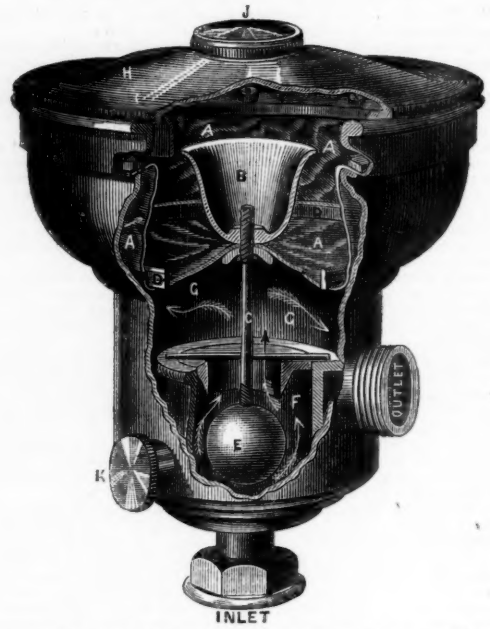
ABANDONMENT OF THE PROPOSED SALE OF THE WINCHESTER WATER-WORKS TO THE CORPORATION.—At the monthly meeting of the corporation of Winchester on the 7th inst., the committee reported that they had received from the gas and water company, in answer to their request, a statement of the terms of the proposed contract for the purchase by them of the water-works. They were comprised under ten heads, agreeing to sell by arbitration, the property to be valued on the present and prospective rents, the council to concur in the obtaining a new Act of Parliament necessary for the severance of the gas and water-works, and the expenses of this, the arbitration, and sale, to be borne by the council, as well as compensation for the severance and to the officers of the company; a deposit of £2000 to be paid on the execution of the contract, and the remainder not later than June 24, 1876; if the council failed to fulfil the contract, the deposit to be forfeited, and all expenses to be paid by the council. The committee instructed the town-clerk to obtain from the company certain information in order that the council might be in a position to judge of the expediency of concurring in the proposed arrangement. Having obtained such information, they now reported that, having fully considered the heads of the proposed terms of contract for the purchase by the council of the water-works, submitted by the company, together with the reply in answer to their inquiries, the committee resolved that they could not recommend the council to entertain the proposed terms for the purchase of the water-works. The report was adopted.

NEW AMERICAN "GAS-SAVER."

Our engraving represents a new regulator or "automatic gas-saver," which was patented in New York on the 19th of May last, and recently described and illustrated in the *Scientific American*. The noticeable feature is the absence of the straight diaphragm, heretofore commonly employed, forming a flat dish, with the valve-rod secured to its centre, and governing the valve through its being forced upwards as the pressure is augmented. The difficulty due to the hardening of this appliance and consequent loss of its vibratory power, is, it is claimed, obviated in the present apparatus, by making the diaphragm of leather, covered with graphite, and in telescopic form, so as to have from 1½ to 6 inches vibratory motion, according to the size of the machine.

The operation will be understood from the sectional view, fig. 1.

FIG. 1



An increase of pressure, whether it occurs in the mains or service-pipe, by putting out lights, is instantly communicated to membrane, A, the tension of which is thereby increased. As the membrane expands, it is forced upwards, carrying with it the rod, C, which works the valve, E, and contracts the aperture through which the gas enters chamber, G; the quantity now admitted in a given time being exactly equal to that which passed when the pressure was less and the opening greater. When the pressure again diminishes, the tension of the membrane is of course relaxed, and being forced downwards by the weight in the cup, B, again carries with it the rod, C, and the aperture to the chamber, G, is enlarged. Thus it will be seen that the saver is a self-acting valve, the operation of which depends on the equalization of atagonistic forces—namely, the pressure of the gas within the chamber, G, impelling the membrane outwards, and the weight, without impelling it inwards. By the combined action of these very dissimilar agents, the area of this aperture, by which the gas enters chamber, G, is exactly adjusted to the velocity with which it moves. From the chamber, G, the gas escapes by the outlet-pipe.

FIG 2

LOW PRESSURE, By use of "Saver." HIGH PRESSURE, Without the "Saver."

The comparative size of the apparatus, and its mode of adjustment to the meter, are shown in fig. 2. The effect upon the flame will also be noticed. The construction is substantial and durable, the best quality of sheet copper, without seam, being used to confine the gas. The valves are ground and fitted so as to control a single burner, and may be readily cleaned of impurities.

HONOUR TO MR. R. A. GRAY.—We learn with pleasure that Mr. Gray, the chairman of the late City of London Gas Company, who has been for many years a magistrate of Surrey, has received the highest compliment which a justice of the peace could receive—viz., the appointment of deputy-lieutenant of that county. At a meeting last Tuesday of the vestry of Camberwell, in which parish Mr. Gray resides, the following resolution was unanimously adopted and a copy ordered to be sent to Mr. Gray:—"This vestry, representing the inhabitants of the parish of St. Giles, Camberwell, desire to express its gratification that the distinguished and well-merited honour of deputy-lieutenant of the county of Surrey has been conferred upon Mr. Robert Alexander Gray by the Lord-Lieutenant of Surrey, the Earl of Lovelace. As a resident justice of the peace for many years, by the discharge of the arduous and responsible duties of that office, always with courteous kindness and consideration, Mr. Gray has secured the fullest respect and esteem of all his fellow parishioners, who, through the vestry, have much pleasure in congratulating him upon this public recognition of his untiring attention to the interests of the county as one of its most efficient magistrates."

LEICESTER WATER-WORKS.

PROPOSED PURCHASE OF THE UNDERTAKING BY THE CORPORATION.

An Adjourned Special Meeting of the Leicester Town Council was held on Tuesday, the 5th inst.—the MAYOR (Mr. C. Harding) in the chair—to take into consideration a motion, of which notice had been given by Alderman Winterton, that the corporation should acquire the undertaking of the Leicester Water-Works Company.

Alderman WINTERTON accordingly moved the following resolution:—"That in the opinion of this council the time has arrived when the corporation should proceed to exercise the powers conferred upon them by the Leicester Water-Works Act, 1847, and the Leicester Water-Works Amendment Act, 1851, to acquire the works, powers, and undertakings of the Leicester Water-Works Company." He said, in support of the motion, he proposed, first, to lay before the council his views as to the position in which the town stood before the inauguration of the water-works company with respect to the supply of water, afterwards to notice the negotiations which had been entered into between the council and the company; and afterwards to give, in his view, good and sufficient reasons why they should entertain the question, at the present moment, of taking over the works of the company, in accordance with the powers they already enjoyed. It would be well known by all gentlemen who took an interest in the business of the town, that the town stood upon a site that was originally exceedingly well drained, and was well supplied with pure and good water. But in the course of ages there was an accumulation of mixed rubbish of various sorts, and with the erection of stables, cesspools, and such things, the water in the wells became contaminated to a very considerable extent. The water, also, from the clay strata, was fully impregnated with gypsum, and was found to contain a large amount of lime, which made it improper for washing and other sanitary purposes. In 1849, he believed, some of the leading and far-thinking gentlemen of the town, feeling deeply impressed with the bad position in which they were placed, in a sanitary point of view, from the existing supply of water, determined to establish a company to get a supply from a river source. With that view they obtained an Act of Parliament raising £80,000, and in this power was given to the corporation at any time after three months notice to take to the works under the valuation of the Board of Trade. At that time there was not sufficient public spirit in the town to take up the matter, and after the thing had stood over a year or more, it was found to be unsuccessful. They could not get sufficient capital, and a negotiation was opened with the corporation to see whether any step could be taken to set the thing afloat; and under the judicious management of Mr. Whetstone and Mr. Stone, their late eminent town-clerk, the corporation agreed to take up all those shares which were unallotted, amounting to £17,500, upon condition that the corporation were to have a considerable amount of water at a low price for the public use, and that the town was to have one-half of the surplus profits of the company, after paying 4½ per cent. to the shareholders. In that Act it was enacted that they should not exercise their power of taking the works compulsorily till after 12 or 13 years had passed. The scheme went on very successfully. The town spread, and the requirements of the inhabitants were so great that the supply of water became insufficient, and another Act was obtained under which the corporation took up more shares, 5 per cent. instead of 4½ being allowed on the new shares before the division of profits. He looked upon it as a great mistake in the members of the council at that time when they found they had to guarantee the dividend of the water-works company for 30 years, as they did under the old bill, not to see that if they had to guarantee the dividend they might as well owe the money, but if they did not do the best thing, they did the next best thing by getting power to take the works. They must not forget that it was very questionable whether at that time the public opinion of the town would have sanctioned the expenditure of a large sum of money by the corporation. They must bear in mind that the inhabitants had been used to a supply of water from wells, and had an idea that it was very much better for drinking purposes and pleasanter to use than even the water of the reservoir, and if it had been proposed to expend £80,000 for the purpose, the probability was the town would not have sanctioned it. Therefore they must not blame the council at that time, as no doubt they did what they thought best for the interests of the town. At the time of the establishment of the company the call for the water was so small the corporation had to pay to make up the dividend something like £8000. That, he took it, showed the difficulty the company had in persuading the people to take the water at the commencement. The matter went on, and now it appeared they wanted another increase in the capital of the company, and a considerable part of this necessity was caused by the introduction in the late bill of powers to supply the outlying villages, as Wigston. He did not at all object to an arrangement of that kind, but he strongly objected to the principle the water-works company set up, that, inasmuch as the corporation had received in the last few years a considerable sum more than they had paid, to make up the dividends in the past, in the new bill their rights were to be ignored altogether. He took it to be a most monstrous assumption that the Parliament of this country would sanction such a proceeding, as a company, when it had arrived at success, kicking down the ladder on which it had ascended. He considered that the water-works company never took any responsibility at all. They were working without responsibility, and the corporation, which had the responsibility, had only four directors. The company spent the money, and the corporation were responsible to pay them a dividend for thirty years; and it would only have been fair and reasonable instead of having only four directors, as they were so deeply interested, that they should have had a number very nearly approaching half. They heard extremely much of the great ability which had been displayed in the management of the company, and probably some gentleman would stand up and say that the council was unable from its weakness to manage the business with that judgment and foresight which had been displayed. He gave every respect to the eminent man they had at the head of the company, but they must know that his time and attention were so absorbed by the great undertakings he had to overlook in railways, collieries, and other matters, that it was impossible for him to bestow careful management and attention upon a little company like that, and he must take a great deal upon trust, and from the reports of subordinates. But it must not be said that what he moved was from want of confidence in Mr. Ellis, or the directors of the water-works, but from a desire that the council should fairly consider the question, whether the time had not arrived when they should take the initiative in the matter of taking over the works. In a sanitary point of view, there could be no question that the supply of so desirable a thing as water, one of the necessaries of life, should be under the control of the sanitary authorities of the borough. It was monstrous to suppose that the power of life and death, as they might say, should be in the hands of gentlemen who, however well disposed, had no interest in the matter only to get as good a dividend as they could from the consumers of the water. When alterations were proposed to them, they said there were their rules, and they had nothing to do with the Sanitary Committee and the town. Having the responsibility of keeping the town in an efficient state of health was one reason that the corporation were bound to use their best exertions, if they could see their way clear, to possess themselves of these works. Why should they not? Other towns did it. The Birmingham Town Council had recently passed a resolution that it was desirable that their water-works should be purchased, and they had no parliamentary rights such as the Leicester Corporation had. The latter were in a much better position, and all they wanted was fixing the sum to be paid. If they appointed 20 committees they could arrive at no nearer conclusion. They knew, if they were to take to the works, that they must be somewhat in the dark to the extent of a few thousand pounds, because it was under the control of the Board of Trade. They could approximate now, because they knew the sums at which various arbitrators had for some years fixed the rate on taking water-works under compulsion. But they were in a better position, as they did not take under compulsion, but under a parliamentary right, and it was merely a question of fixing a reasonable price. He thought, having that parliamentary right, which they had had ever since the company was a failure, would very much tend to mitigate the amount which the water-works company would be entitled to expect at the hands of the arbitrators. He had a list of towns which had bought their water-works during the last 10 or 12 years, and letters from the town-clerks of some of those towns, stating the good results that had accrued from the possession of the works. Among these towns were Wolverhampton, Rochdale, Lincoln, Liverpool, Leeds, Bolton, Bradford, Preston, and Oldham. They had letters from those towns speaking eminently of the good results that had accrued to the finances of the towns in consequence of owning the works. The valuation in some of these was £112 for a £100 share, and even should the Leicester Corporation be thrown on to that value, it would not be a back-breaking burden; but, with their parliamentary right, co-existent with the company, he had hopes they would be able to get off for something less. They must bear in mind that, supposing they took these works, they would have to form a sinking-fund for the purpose of repaying the money. It was usual in these cases to put by something like 1 per cent. for the purpose. In Lincoln they had agreed to borrow the money from the Bank of England, and to pay it off in 50 years. He thought that the Town Council of Leicester could afford to put by so small a sum as would be required to extinguish the debt that they would have to incur for this purpose. They were possessed of a large landed estate which they were continually selling, and it had been urged over and over again that they were doing some injustice to their posterity in frittering away that estate without providing anything to replace it. It was their duty, either by the purchase of water-works, or land, or property that would be increasing in value in these prosperous time, to place their descendants in as good a position as they were at the time they took the estate. He hoped the council would consider that fully in reference to the payment that they would be required to make. It was absurd to suppose that they could not afford to pay £2000 or £3000 to a sinking-fund to pay their debts. He hoped that would satisfy the gentlemen who were terrified at the large sum they would have to pay. Some trouble had been taken in analyzing the well water of the town, and they would be surprised to hear that a large number of wells were being used not only in cottage property, but first-class houses, which were frightfully contaminated. At the same time they were unable to do anything to relieve that difficulty. They had continually plans coming before the Highway Committee, in which the builders proposed, instead of availing themselves of the water-works, to make wells and take the water from strata which they knew were contaminated by inward filtration in time of floods. In consequence of this they found, on looking over the water-works reports, that the revenue from house property was increasing very slowly indeed. They would suppose, from the vast number of houses and factories that were being built, that the water-works receipts would increase by a large per centage year by year; but, instead of that, in one or two years past they would find that it was almost hide-bound. It did not increase according to the number and value of the houses. The regulations were so onerous on the builders, that they preferred putting up pumps and wells to laying on the water. There must be some inherent error in the regulations which made a man spend £10 or £12 in digging a well and putting down a pump. It was evident, at the time the water-works were established, it was the intention of the corporation to take them as soon as they could do so; they said, in effect, they had pressing things upon them, but they would do it in 12 or 13 years. They would, therefore, be very much wanting this day in their duty to the town they represented if they did not now take up this question, but should suffer the opportunity before them to slip. He trusted the manner in which he had expressed himself would not injure the cause he had advocated.

Mr. RICHARDSON seconded the resolution, and stated that he had had a number of well waters analyzed by Dr. Meadows and Mr. E. Jones, with the result that the solid matter varied from 95 to 148 grains per gallon, while the quantity allowed by the highest medical authority was not more than 35 grains per gallon. Many waters, which for want of proper examination had been passed by the committee as potable, were found to be contaminated and dangerous. At Birmingham the capital of the water-works was stated to be £621,000, and that was to be taken to at £1,000,000, but the Mayor of Birmingham said that the increase of capital was £100,000 a year, so that with a longer delay they would have to pay more. There was a prospect now of sanitary legislation, which would render the possession of the water-works exceedingly desirable. He was grieved to see in the papers the other day that a poor creature was fined 7s. 6d. for stealing water; it seemed very hard that poor people should be fined for taking an element of health and a necessity of life, and compelled to take what came from a poisonous pump.

Mr. GRIMSLEY said that a motion which involved something like doubling the borough debt, and raising the liabilities of the corporation to half a million, deserved the very best consideration, in order that they might ascertain the relative advantages and disadvantages of the proposal, before accepting or rejecting it. The question of purchasing the water-works had been occasionally referred to by public speakers, but the gravity with which it was now invested was due to the proposal made by the directors to the Parliamentary Committee of the council, which he was told was inimical to the interests of the town. He thought considerable misapprehension existed upon this point. The water-works directors seeing that the corporation had received something like £17,220 by way of surplus profits, in reduction of the guarantee they had given, felt that they were justified in asking the corporation, not to forego their rights, but to consent, in order that they might consolidate their stocks and make them more marketable, to allow the original £80,000 to take 5 per cent. instead of 4½ before deducting the surplus profits. If they agreed to this it would save the cost of opposing the bill, and also the costs of the company, which would reduce the surplus profits; and the amount was only £200 a year, or as they had one-fifth of the capital themselves, £157 10s. Supposing they agreed to the resolution, they must give for the shares something above the market value, which he believed was now about £34. At that price the shares would pay about 4½ per cent., and supposing they had to pay about £40, they would get only 3¾ per cent. for their capital. He asked whether it would be wise to borrow money for this purpose at 4½ per cent., and thus lose 1 per cent. upon £250,000 or £300,000. Did they think the corporation, which was a fluctuating body, could manage the concern more economically than it was now managed? If they gave the public advantages they must, of course, diminish their revenue. The gross revenue he found was a little over £19,000, and the cost of management £3546. At Hull, where the business was managed by the corporate body, the revenue was about £22,000, and the cost of management £19,000. There was a great deal of pumping at Hull, and fuel alone cost £7304. He did not deny the importance of the sanitary question, and that it was desirable to prevent people using contaminated wells, but was it necessary to take the steps proposed to do that? They would have to ask Parliament to insert a clause compelling the owners to take water-works water, and could they not do that now? What was to prevent their getting a clause to compel builders, where the situation was unsuitable for a well, to take the water-works water? They were now enjoying advantages which no other town in

England enjoyed, and he urged upon them to consider seriously before they made any change.

Alderman KEMPSON contended that the water-works had been a great benefit to the town, as without an ample supply of water it could not have increased as it had done; and but for the company the matter would not have been taken up nearly so soon. He considered they should have a conference with the company rather than oppose them, which must be costly to both sides. It had been said that water-works had been taken in many times, and had proved beneficial; but it had been shown that it was not beneficial in Hull. At Bradford the cost of the works was £1,140,290; 5 per cent. on this was £57,014, and the receipts for the last year were £57,440, and the expenditure £60,820. There was an actual loss of £3384, which the ratepayers had to make good. The rates of charge were most important, and at Bradford, on houses from £5 to £20, they were 38 per cent. more than here; from £20 to £45, 47 per cent.; and from £50 to £100, 50 per cent. more; and on water taken for manufacturing purposes, they paid 20 per cent. more. At Halifax, they paid 11 per cent. more for water. The works there cost £235,320, and their profits last year were £1034. Their sinking-fund absorbed a great deal more than their profits. At Leeds, the works cost £899,800, and their profits last year were £3756, and the reserve-fund took more than that. In all these cases, taking the works had been disastrous. At Nottingham, the corporation attempted to take the water-works; the shares were £25, and as they were paying 10 per cent., they were made £50; and the corporation could not have these shares without paying £90 for them. Here he was satisfied they could not put down the £25 shares at less than £45. Last year they paid only 5½ per cent., and that would be very small on the increased amount. It would be a very serious loss to the borough now, though no doubt in 30 or 40 years it would be a very fine property for the town, and the question was, whether they were prepared to make a present sacrifice for that object.

Alderman STAFFORD said he concurred with the mover and seconder in the sanitary view, but the pecuniary question was a serious matter. The share capital amounted to £200,000, and the borrowed capital to £50,600, making £250,600. The present value of this, according to competent judges, was £336,000. To this must be added, if taken by compulsion, £80,000, bringing the whole to £416,000. If they borrowed that at 4½ per cent., they would have to pay £17,700 a year for interest. The profits of the company amounted to £12,000 or £14,000 a year, so that there would be a loss of £4000 a year to make good. And then there would be also the sinking-fund, some £8000 a year, which would amount altogether to a rate of 1s. in the pound. No doubt 30 or 40 years hence, it would be a grand thing for their grandchildren, but it would be a very serious matter for the present generation. He considered they ought to rest satisfied with their present advantages.

Alderman STEVENSON suggested the desirability of having the deliberations of a committee on the subject. He considered the council were trustees of the public health, and, therefore, were bound to have especial reference to the sanitary point of view, and to secure such powers as should effect all the purposes they would be able to carry out if they had the works in their own hands. He might point out that in the address of the Mayor of Birmingham 50 or 60 towns were mentioned which had taken their water-works, and, in most cases, beneficially to themselves.

Mr. UNDERWOOD said he had been for a considerable time of opinion that the best thing the corporation could do was to take the water-works, though he had thought that their powers had lapsed. He saw from their reports that 12 years ago the company contemplated the possibility of the corporation taking their works; and it seemed to him now that the time had arrived when it really should be done. As to the proposition of the company, it seemed to him that they should not give up what was equivalent to a capital of £4000 without obtaining equivalent rights. They knew there was a conflict between the sanitary authorities and the water-works, and there would be so long as they were different bodies. They would not get the ratepayers to take views consistent with the wishes of the water-works company, and it was not likely people would be enforced to take the water when it was under private and irresponsible management. Their directors were in such a minority that nothing for the benefit of the town could be carried.

Alderman BURGESS hoped Alderman Winterton would agree to have a committee to investigate the question fully. He did not think a case had been made out for taking the works at present, and he had no doubt they might arrange to have a clause inserted in the new bill giving the council compulsory powers to say that any owner of property or speculative builder should furnish their tenants with good water, and on a decision by the council or magistrates the water-works company should furnish the water.

Alderman VICCARS, as one of the directors for the council, wished to express his belief that it would be greatly to the disadvantage of the council that any change should be made. He would be sorry that any vote of the council should sever the connexion, which had up to this time been satisfactory. No doubt they might have been glad to have seven or eight directors, but the general feeling of the council was against water-works, and if it had not been for gentlemen not connected with the council taking the matter up, in all probability they would have been at the present day without water-works. As to impure wells, they might order them to be filled up, and still retain their connexion with the company.

Mr. MILLICAN was perfectly satisfied the town was in as good a position as could be with reference to the company, and thought that Alderman Winterton had failed to make out a fair case for the purchase of the works. He had shown no grievance, nor stated what the probable expense would be. He thought they were in a very good position, with the company at their hand, ready to supply water.

Mr. FOWLER thought there was a strong feeling in the meeting against taking the transfer of this property, in which he entirely concurred; but he considered it was of great importance to have the matter thoroughly investigated. Mr. Winterton was perfectly right in saying if this was to be done, now was the time to do it. The matter was so important, that it could not be fully discussed in a single meeting like that, and therefore he trusted that a committee would be formed to investigate the matter.

Alderman G. BAINES appealed to Alderman Winterton to withdraw his resolution, and accept a proposal to refer the whole matter to a committee. He moved an amendment that the question be referred to a committee, to take the whole matter into consideration.

Mr. VICCARS seconded the amendment.

Alderman WINTERTON, in replying, protested against the assumption by Mr. Grimsley that the water-works company were doing them a great favour in allowing various clauses to be inserted in their bill. He took it they had a parliamentary right, equal with the company themselves. As to any idea of ignoring their rights in sharing fresh stock, it was altogether a fallacy; it would not be allowed for a moment. As to driving the matter into a conflict, the company came and told them in the most deliberate way, "That is our course; if you do not agree to accept our terms we shall fight you." What were they to do when a man like Mr. Ellis told them that he intended to fight? That being the case, they must bear in mind that one-half of the expense would come out of their pockets whether or no. The expense that would be incurred this session of Parliament was thrust upon them by the directors of the water-works insisting upon altering the terms upon which they had bargained. He did not go into the financial matters, as he could not; no one could know what the arbitration would be to a few pounds, and it would be monstrous to go and assume one price or another. He took it the greatest amount they would have to pay would be what had been paid to other companies. He was sorry to find that so many aldermen seemed to completely ignore all the principles of liberal government. They understood that the power lay in the people, and that the town should be governed by the votes of the inhabitants, instead of which they went upon this matter being worked by some pressure out of doors. There was no more reason why a pressure should be put upon them as to the rates for water than for the poor or the borough, and they never heard of anything of the kind. As to Bradford, he had a letter from the town-clerk, in which he stated that the water-works had been as a backbone to the town, and a very great success; the income was £10,000 when bought in 1854, and was now nearly £56,000. They had similar letters from other towns. With regard to Hull, that place was simply in a bad position because all the water had to be pumped up 350 feet. He wanted to be assured of the support and sympathy of the council in the contest with the company on which they must enter, and it would much strengthen their hands if they agreed to the resolution if necessary to carry over the works. As to going to Parliament for a clause giving power to compel the people to take the water, it was monstrous to suppose they would do anything of the kind, which would be simply enhancing the value of the water-works against themselves. It would be a most indiscreet thing to make the water-works company rich, for, when they or their children came to purchase the works, they would have to pay not only for the value of the property, but for their own folly too.

Ultimately, Alderman WINTERTON agreed to adopt the amendment, which was carried unanimously in the following form:—"That, in the opinion of this council, it is desirable to appoint a committee to consider and report to the council as to whether or not, in the opinion of such committee, the time has arrived when the council should proceed to exercise the powers conferred upon them by the Leicester Water-Works Act, 1847, and the Leicester Water-Works Amendment Act, 1851, to acquire the works, powers, and undertakings of the Leicester Water-Works Company, and that such committee be authorized, if they think it desirable, to confer with the directors of the water-works company, and to consider and report upon the whole question."

A committee of the members was then appointed, and the proceedings of the council terminated.

THE LAW OF THE DIFFUSION OF GASES.

At the Ordinary Meeting of the Manchester Literary and Philosophical Society, on the 1st ult., Mr. HENRY H. HOWARTH read a paper on "Some Doubts in regard to the Law of the Diffusion of Gases," the substance of which is given in the *Chemical News*.

The author said that he had a difficulty in reconciling the conclusions drawn by Dalton, Berthollet, and Graham respecting the diffusion of gases with the actual facts of nature, and it seemed to him that the only way in which the inferences drawn from experiments in the laboratory and what was going on in nature on a large scale could be reconciled was in the belief that either diffusion was extremely slow in some cases, or that it was sometimes prevented.

He argued that the continuity of condition between gases and liquids, which had lately been so admirably illustrated, made it, *a priori*, probable that similar laws prevailed in both classes of matter in respect to their laws of diffusion, &c., and that, as in the case of liquids, the law of diffusion was not a universal one, but had at least apparent exceptions, so also among gases there might occasionally be conditions which resisted or very greatly impeded the operation of the law. He granted at once that the gases that form air, and many others, bear uniform testimony to the correctness of the generalization; but in the case of carbonic acid, watery vapour, and hydrogen there seemed to be some room for doubt. The fact that in all abandoned wells, tunnels, and mines, where atmospheric currents do not play, and where there is no absorbing vegetation, there is an accumulation of carbonic acid gas, although these hollows have ample access to the air, goes to show that the rate of diffusion must be exceedingly slow in these cases, if, in fact, diffusion be not actually suspended. The mephitic vapours in low valleys in volcanic districts, and the gases that generate malaria in many low-lying marshy districts—such as the Maremma, in Italy, the neighbourhood of Montpelier, in France, &c.—seem to point in the same direction. The very diverse condition in regard to the amount of watery vapour contained in contiguous areas of the atmosphere, whether we examine it in different neighbouring localities or in the superimposed strata of air in any particular locality, show that the working of the law of diffusion is here greatly impeded.

In regard to hydrogen, the evidence is somewhat different. It is clear that if, under certain condition, hydrogen be an exception to the general law of the diffusion of gases, and follows rather the more general law of gravitation, that it will exist in a stratum above the atmosphere and beyond the reach of direct observation. In his experiment upon the occlusion of gases, Mr. Graham examined several aërolites, and found that under the air-pump they parted with a very large quantity of occluded hydrogen. If, as is probable, the gas was occluded by the aërolites when at a red heat, and this red heat was coincident with their passage through that layer of the upper atmosphere in which the phenomena of shooting stars and of the aurora occur, it seems more than probable that this stratum is a layer of hydrogen. This is confirmed by what we know of the spectrum of certain auroras, which resembles those of the zodiacal light and the solar corona. The spectrum of the corona has been the most attentively studied, and Janssen, perhaps the greatest authority on it, speaks most confidently about its distinguishing feature being the hydrogen lines, while a special line which characterizes both its spectrum and that of aurora, and which is different to that of any terrestrial substance, is considered by Father Secchi to be an abnormal hydrogen line. Dr. Dalton long ago argued, as Mr. Baxendell has reminded Mr. Howorth, that the peculiar features of the aurora could best be explained by the hypothecation of a stratum of some peculiar gas above the atmosphere. A gas of a "ferruginous nature" is the expression of Dr. Dalton. Now hydrogen in the higher chemistry is not only classed among the metals, but Faraday and others have shown that in its relation to magnetism it is nearly allied to iron, so that a stratum of hydrogen above the air would seem to exactly answer Dr. Dalton's postulate. If it should exist, the earth would resemble the sun in one remarkable feature, for we now know that the sun is girdled with an immense layer of hydrogen. Lastly, he added that the heterogeneous texture of the gaseous nebula, like the great nebula in Orion, seems to argue that the law of the equal diffusion of gases does not prevail there.

Mr. Howarth presented these facts with considerable hesitation, his excuse for doing so being his view that all physical laws are tentative only—that is, they are good as long as they explain all the facts, and no longer, and that it sometimes becomes a duty to present apparently aberrant and abnormal facts to an audience so well qualified to criticize them as the Manchester Literary and Philosophical Society, in order that they may either be brought within the law, or that the law may be revised.

BURSLEM GAS SUPPLY.—At the meeting of the Burslem Local Board on Thursday last, the gas inspector (Mr. Blackshaw) reported that the illuminating power of the gas during the month had been very variable, the maximum being equal to 14·85 candles, the minimum being 12·2, and the average 12·88 candles. Sulphur had been in excess, but the gas had been free from sulphuretted hydrogen. The illuminating power had been nearly two candles less than in November. The pressure had been deficient on a few evenings. During the past ten days the gas had been greatly improved. Mr. Hulme gave notice that at the next meeting of the board he should call attention to the desirableness, or otherwise, of opening negotiations with a view to the purchase of the gas-works.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is not a great deal of new business doing in the local iron trades, and at many of the second-rate establishments old orders have been entirely worked off the books, with very doubtful future prospects to depend on. Several firms have already reduced the rate of pay of their *employés*, others have given notice of an extension of working time from 54 to 59 hours per week, and there are even greater alterations in contemplation.

It is probable, I am informed, that the wages of blast-furnace men will shortly be revised and reduced, in addition to certain alterations being made in the scale by which their Sunday work is computed. It is thought that the men will have to submit to being paid at the ordinary rate, instead of double time, as at present, and that their hours will be extended. Should these changes be effected, pig iron and, secondarily, castings will probably be cheapened somewhat.

Current quotations for Middlesborough general makers brands of pig iron are as under:—No. 1 foundry, 66s.; No. 2 foundry, 62s. 6d.; No. 3 foundry, 60s.; No. 4 foundry, 58s. 6d.; No. 4 forge, grey, 57s.; No. 5 forge, mottled, 56s.; No. 6 forge, white, 54s.; refined metal, 79s.; Kentledge, 65s.; cinder, 47s. 6d. per ton.

There is a good business in house coal, at an advance of 1s. to 1s. 6d. per ton, but steam and manufacturing coals do not experience any great revival of demand. Prices of these qualities, as well as ordinary slack, are unchanged. The thaw has liberated the canal, so that navigation has been resumed between the collieries, &c., along its route.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The ordinary quarterly meeting of the iron trade of this district will be held in Birmingham on Thursday next, when prices for the ensuing quarter will be definitely settled. Meanwhile, of course, business is much restricted, and opinions as to the policy of the ironmasters are still conflicting. Prices generally continue firm; makers who offer easier rates find no difficulty in booking orders; but, as a rule, both buyers and sellers prefer waiting until the result of the meeting shall be made known. The wages of the ironworkers are to be reduced according to the sliding scale of payment adopted some months ago, whereby the rate of wages varies with the average selling price of iron of 12 selected firms. The reduction announced by the scrutineers is at the rate of 1s. per ton on puddlers wages, and 10 per cent. in other departments of the trade. A proposal to reduce the wages of blast-furnace men to the like extent is now under discussion, and it is very probable that the men will receive notice shortly. The scarcity of native ironstone continues, and prices have an upward tendency. It is stated that, owing to the high rate of wages now paid to the ironstone miners of this district, the cost of raising the ore is in excess of the amount for which mineral of richer quality can be imported from other districts. Staffordshire pigs are consequently firm, and in somewhat improved demand as regards the better qualities, but common and cinder pigs are without change. In finished iron, well-known brands maintain their value, but unmarked bars are now readily obtainable at £9 per ton. The present suspense as to the course the coalowners and ironmasters intend to pursue is seriously interfering with the heavy hardware trades of the district; the tube makers especially strongly condemn the apparent attempt to defer the inevitable reduction which alone can give stability to the market.

Coal, though not quotably higher, is in much improved demand; the canal traffic is now resumed throughout the district, and consumers stocks having considerably diminished during the frost, much activity is now displayed at most of the collieries, and the prospect of an early reduction in prices is much weaker. The trial boring of the Cannock and Huntington Colliery Company, Limited, on the estate of Lord Hatherton, has been abandoned; the directors, who are very sanguine as to the ultimate success of the enterprise, having decided to sink a shaft without further delay.

Coke is in improved request, and prices are stronger.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

The coal trade generally of this district continues good. For house fire coal there is a brisk demand, and as colliery proprietors are still very much behindhand with their deliveries, many of them are not yet in a position to take on orders from fresh customers, but with the milder weather now prevailing, this is a matter which it is expected will right itself before long. For steam fuel there is also an active demand, but supplies of this are more plentiful than in the better classes of coal. Prices, generally, are very firm, at the full list rates, but it is only in exceptional cases that advances have been made. The pit prices in the Wigan district range about 13s. to 14s.; for Pemberton mines, 11s. to 12s.; for Ince mines, 7s. 6d. to 8s. for burgy; and 5s. 6d. to 6s. per ton for slack.

For gas coal there is still an active inquiry, and as many of the gas-works continue very low in stocks, there is a good deal of pressure for supplies, higher prices being offered in many cases for prompt deliveries. Generally, however, prices, though firm, are not altered, but as there is so little coal of this description offering in the open market, quotations are of little value at present.

So far as the railway companies are concerned, although the block in the traffic is being gradually removed, there is not much improvement to report in the deliveries of coal, and the matter was brought under the consideration of the South Lancashire and Cheshire Coalowners Association, at the usual monthly meeting last week. Nothing definite was resolved upon then, but if the railway companies do not make some alteration, it is understood that a committee will be appointed at the next meeting, to take the necessary steps. The canals being now open have afforded a good deal of relief, and this latter means of transit will now be made use of by colliery proprietors to a much greater extent than hitherto, not only as a matter of necessity, but in consequence of the treatment which they have recently received at the hands of the railway companies.

Most of the pits have been stopped for nearly a week in consequence of the new year holidays, and the miners have renewed their agitation for a return to the old rate of wages, but as the present state of the market, upon which their demand is based, is likely to be only of a temporary character, it is not probable that any alteration will be made by the colliery proprietors.

The iron trade continues in a very dull state, and for pig iron prices are weaker to the extent of about 1s. per ton for both forge and foundry qualities, No. 3 foundry, delivered in the Manchester district, being quoted as low as 68s., and forge numbers at about 64s., but even at these figures consumers do not seem at all anxious to cover their requirements. In manufactured iron there is very little doing, as buyers are all waiting for the quarter-day prices, and the few orders that are given out are simply to cover immediate requirements. Bars, delivered in this district, are still nominally quoted at £9 5s. to £9 10s. per ton.

The local forges are still moderately employed, but are not working to their full production; founders, engineers, and machinists, although in some cases fairly supplied with work, are mostly in want of orders.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The railways and colliery waggon ways were cleared of the ice and snow last week, and the pits got to work again. Gas coals were in excellent demand, and a considerable quantity was shipped. The gas coal pits wrought very well, and the coal offices had somewhat less difficulty with the railway companies in getting the quantities to the shipping places. Coasting tonnage was tolerably abundant. The rates did not change from last week. The gas companies usually open negotiations with the collieries in January with a view to enter upon contracts for the season. But very little business is reported to have been entered upon in that direction yet. The question of wages seems to be settled in the Durham district at present; but there is a good deal of speculation as to the likely effects of the misunderstanding in the South Wales coal trade, and the coal market here is likely to be a very open one in the first month of 1875 at any rate. The household coal trade is tolerably active. Prices are firm, but if the present mild weather were to continue long we might expect this trade to be less active. The steam coal trade is very dull. Some of the large pits in Northumberland wrought little more than two days last fortnight. The prices of steam coals are hardly likely to be maintained at the present figure, especially if the South Wales coalowners secure a reduction upon their men's wages, which they are likely to do. The wages of the Northumberland colliers come up for revision this month, and there is every prospect that there will be another reduction of 10 per cent. all round. The manufacturing coal trade remains in a deplorable condition. Much of this class of coal is valueless at present.

The iron trade of the Cleveland district gets worse instead of better. The pig iron trade is beginning to feel the long-continued depression, and the new year's prospects of the iron trade of the North of England have not been so dark for the past half-dozen years.

The chemical trade of the Tyne still remains in the same dull and lifeless condition which characterized it during the last three months of 1874; most of the manufacturers state they are losing upon the business they are doing. The workmen have expressed themselves willing to submit to a reduction of 20 per cent. on the wages; but the masters want the men to work the same time as they did previous to 1870. They refuse to do so, and so matters stand at present.

NATURAL GAS SUPPLY AT CHATILLON (HAUTE SAVOIE), FRANCE.—The soil beneath this place is impregnated with carburetted hydrogen gas from some subterranean source, a bore-hole driven to the depth of only one mètre yielding a fair supply of gas, which will burn five or six hours. Attempts are being made to utilize it for processes of illumination.

GAS EXPLOSION AT STIRLING.—Late on Tuesday night last, Jan. 5, a gas explosion of a somewhat serious nature occurred in Forth Place, Stirling. It appears that in consequence of the late frost something went wrong with the gas-meter in the house occupied by Mr. W. Davidson, clerk. In the course of the night his wife, carrying a lighted candle in her hand, went into the lobby. She had just opened the kitchen door when a loud explosion took place, throwing her to the ground, and when picked up it was found that her face and arms were dreadfully burned. The door of an adjacent parlour was forced open, and two of the panes in the front windows blown out. Curiously enough, the explosion did not enter the kitchen, the door of which was open, and where a child was asleep.

GAS EXPLOSION AT MIDDLESBROUGH.—At an early hour on Thursday morning last a violent explosion of gas occurred at the chemical works of Dr. S. A. Sadler, Cargo Fleet Road, Middlesbrough, which caused the destruction of the time office. The time office was also used by the workmen to get their meals in during the night. The gas-meter was placed in one corner of this office. Soon after midnight, whilst a workman named James Neave was smoking his pipe, a violent explosion occurred. Three walls of the office and the roof were blown away, and a wall adjoining the blacksmith's shop was also damaged. Neave himself was blown a distance of six yards from his seat before the office fire. He was removed to the North Ormesby Cottage Hospital, where it was found that, though severely bruised, no bones were broken. It is thought that the explosion was caused by an escape at a bad joint of the supply-pipe.

NEATH WATER COMPANY.—This company is now seeking to obtain an Act of Parliament for carrying out very extensive works, in order to supply Taibach, Aberavon, Briton Ferry, Skewen, and Neath. It is proposed to impound the waters of the river Pellenna by forming a reservoir which will contain 400 million gallons. There will also be the present Gnoll reservoir, which holds 22 million gallons, and which will be considerably enlarged, so as to be capable of additional storeage. A new company is to be incorporated to purchase the present company. A capital will be raised of £150,000, in 15,000 £10 shares. Power is taken to create debenture stock, and all moneys borrowed on mortgage are to have priority. A committee of the Town Council have met to discuss the proposal on behalf of the corporation; but it is not known publicly what steps are to be taken in reference to the bill.

INTERRUPTION BY FROST OF GAS SUPPLY.—During the recent severe weather the distribution of gas has been seriously interfered with in many districts, and sundry suggestions have been made by gas managers and consumers on the subject. Our esteemed friend, Mr. Reid, of the Edinburgh and Leith Gas Company, has addressed the following letter to *The Scotsman*:—

"GAS-METERS AND FROST.

"*Edinburgh and Leith Gas Offices*, 8, *George Street*, *Dec.* 29.

"Sir,—It is certain that with a continuance of the cold of the last few days the consumers of gas will shortly be subjected to annoyance and much inconvenience by finding their supply stopped, by the meters becoming frozen, unless by timely attention on their part it is prevented by protecting these instruments—whether they be what is called wet or dry meters, both being liable to interruption by severe frost—by enclosing them, when exposed to cold, within suitable coverings or wrappings to ward off the frost. And when a stoppage may be apprehended, the application of a hot brick or a bag of hot sand for several hours during the day, will, in all likelihood, effect a thaw if the frost has set in, and secure a supply in the evening. Unlike the ordinary causes of temporary interruption to the supply of gas, frost cannot be dealt with and remedied promptly after it has got hold of the working parts of the meter, and this suggestion of the necessity of a little attention on the part of the consumers of gas may save a deal of annoyance, and prove, as in other cases, that prevention is better than cure.—I am, &c., John Reid."

A correspondent of the *Glasgow Herald* writes:—

"FROZEN GASHOLDERS.

"Sir,—Many gas managers will be severely taxed, as well as myself, to keep their gasholders free from ice to ensure a uniform pressure. Having tried experiments for two days, I have at last overcome the difficulty by a very simple process—viz., salt, applying it uniformly around the gasholder, and in a very few minutes the ice is completely dissolved.—I am, &c., B. A. P."

BARTON LOCAL BOARD AND THE COPORATION OF SALFORD.—At the meeting of the Barton Local Board on the 4th inst., the clerk (Mr. G. Trenbath) stated that he had obtained the consent of the Local Government Board to the gas bill proposed to be introduced at the next session of Parliament by the board. It required the consent of the Home Secretary yet, but he had no doubt they would get that in the usual way. Since their last meeting a deputation from the millowners, foundries, and largest ratepayers had waited upon him (the clerk) with reference to the arrangements to be entered into between the board and them-

selves, and they stated that they were determined to strengthen the hands of the board as far as possible, even if it were by the employment of counsel; and, furthermore, they said that if the Salford Corporation did not come to some terms in the matter of reduction, the owners and ratepayers mentioned had decided as a body that in case the proposed gas bill was "shelved" they would give notice to the Salford Corporation that they would discontinue to take their gas, and they would themselves erect works in their own district for the supply of all the large consumers. The clerk then read a letter, which had appeared in the Manchester papers, as a reply to Mr. Tysoe's speech at the last meeting of the Salford Council, and which contradicted several of the statements of that gentleman as to the manner in which the deputation from the board had been received by the Gas Committee of the corporation. Mr. Farron said the mayor of Salford was distinctly told that the board had never asked for any share in the profits if the corporation continued to supply them, and that they considered the responsibility of any accidents should be borne by those who reaped the benefit of the manufacture of gas. And, further, when it was remarked that the corporation had made no profits last year, one of the members of the deputation said they were not there to consider the good or bad management of the corporation. Some conversation with reference to the action of the board on the Salford Tramways Bill then took place. The clerk said he had written to the town-clerk of Salford, asking him to supply the board with the wording of the clause which they proposed to insert in their bill; and he had replied, asking for a statement of the views of the board on the subject. He (the clerk) had sent him the resolution of the board, which was passed some time ago. It would be necessary to convene a meeting of the ratepayers on the subject.

EXPLOSION OF A KITCHEN BOILER AT SALFORD.—Mr. Price, the coroner for Salford, held an inquest, on the 6th inst., on the body of a domestic servant, named Margaret Roberts, who was killed on the previous Saturday by the explosion of a kitchen boiler in the house of Mr. Barrett, Eccles New Road, Manchester. A report was read from Mr. Lavington Fletcher, the chief engineer of the Steam Users Association, who had been requested by the coroner to examine the remains of the boiler. He found that the injury done had been far greater than could have been expected from so small a boiler. The boiler was of cast iron, and measured 12½ inches in length by 10 inches in breadth and 10½ inches in height. It had two pipes connecting it with an overhead cistern placed near the roof, one of these pipes being for the downward current of cold water, the other for the upward current of hot water. In each of these pipes there was a stop-tap. These pipes had no branches springing from them, the service-pipes for supplying the bath, the lavatory, and the scullery being drawn off direct from the hot and cold water cisterns. The pipes, therefore, connecting the cistern with the boiler, which were the circulating-pipes, were quite distinct from the service-pipes. One of the service-pipes burst during the recent frost, and on Friday evening, the 1st inst., when there was a slight thaw, began to leak. Thinking to disconnect this leaking service-pipe from the cistern, and thus stop the leakage, Mr. Barrett shut off the two stop-taps that were placed in the circulating-pipes; but, finding this of no avail, opened the hot and cold water-taps in the bath, and, blocking up the ball-tap that regulated the supply, soon emptied the cistern, drained the pipe, and stopped the leakage. The next morning the plumber mended the leaking service-pipe, when Mr. Barrett called his attention to the stop-taps in the circulating-pipes, telling him that they worked very stiffly, and that he thought they were out of order, while, at the same time, he requested him to see to them. The plumber left the taps shut off, but, nevertheless, gave instructions that all was now right, and that the fire might be lighted. The members of the household, being quite inexperienced in these matters, followed the instructions of the plumber. They lighted a gentle fire shortly after one o'clock, when, as the stop-taps in the circulating-pipes were shut off, there was no outlet for the pressure, and it consequently went on accumulating as the fire went on burning, till, a little after four, the strength of the boiler was overtasked, and it was split in two by the expansion of the water. The cause of this explosion, therefore, was not the frost, but the lighting a fire with the stop-taps in the circulating-pipes shut off. Such explosions might easily be prevented by fixing a small reliable safety-valve to the boiler, which would give relief if the pressure at any time were unduly raised. A sample of a safety-valve specially adapted for household boilers was produced for the inspection of the coroner and jury. The jury found a verdict of "Accidental death," and added a strong recommendation that no domestic boilers should be allowed to work without a safety-valve or other equivalent means of relieving the pressure, or before inspection by some competent official person; and further, that the foreman of the jury be requested to urge the matter on the attention of the Salford Corporation.

STAFFORD WATER SUPPLY.—On the 5th inst. a meeting of the Stafford Town Council was held—the Mayor (Mr. Shallcross) presiding. The meeting had been specially convened in the manner prescribed by Act of Parliament, having regard to the proposals to establish water-works for the supply of Stafford and neighbourhood, as set forth in two distinct schemes promoted by private companies. At a meeting of the council, held some six weeks ago, a proposition to establish water-works under the control of the council was carried by a majority of one. Since then the parliamentary notices of the two private schemes referred to have been published, and it appears that one of them proposes to raise £40,000, in shares, and £10,000 under borrowing powers; while the other puts its share capital at no less than £60,000, and asks for borrowing powers for £15,000 besides. The object of the present meeting was, first, to decide whether these schemes should be opposed; and the second was to decide as to asking the householders in whom Stafford Common is vested for permission to bore for water on the high ground in the neighbourhood of Marston. Mr. Day proposed that the schemes of the two private companies be opposed, and that the town-clerk be instructed to take the necessary steps to ascertain the opinion of the ratepayers, by public meeting or by a poll, as to continuing the opposition. Alderman Buxton seconded the proposition, which was carried. The second proposition—viz., to obtain the consent of the householders for the boring of the upper part of the common for water, was also proposed by Mr. Day, who entered into an inquiry as to the cost of making the experiment. He believed that in the vicinity of Marston there was an abundant supply of good water near the surface. Alderman Evans seconded the proposition. He said he had been informed that the height of the common near Marston Gate was equal to the highest part of the county prison. If, therefore, the water on examination was found to be plentiful and good, they had at their command the means of amending the present system should it be proved beyond doubt that the pumps of the town were really past improvement. The adoption of the proposed plan would enable them to answer all the arguments which had been urged in favour of the water supply being left to the management of companies. They would be able to undertake the works without litigation, or even parliamentary powers, and so a vast sum of money would be saved. Mr. Wright opposed the motion on account of the expense of boring, which Mr. Day had put at £100 per month. Alderman Buxton also objected to the proposition; and Mr. Cox regretted that he could not vote with the proposer, as he thought before any money was spent they had better get some reliable opinion as to whether they might expect to find water in sufficient quantity. Mr. Day having explained that his proposition only went to the extent of obtaining the consent of the householders to make the experiment, the mayor submitted the resolution, which was carried almost unanimously. The town-clerk read a letter from the Local Government Board, which was accompanied by a draft of the Provisional Order abolishing the Improvement Act. The board proposes to let the order come into full force on the 29th of September next. The debt now owing by the commissioners, which amounts to £2000, with their other liabilities, is to become chargeable to the borough-fund. The effect of the votes taken on the water supply is that the town must be immediately consulted upon both points before any money can be spent.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

4464.—HASELTINE, G., Southampton Buildings, London, "Improvements relating to the slide-valves of steam-engines." A communication. (Complete specification.) Dec. 29, 1874.

4466.—HASELTINE, G., Southampton Buildings, London, "Improvements in motive-power engines to be worked by steam, air, or other elastic fluid." A communication. (Complete specification.) Dec. 30, 1874.

4486.—HASELTINE, G., Southampton Buildings, London, "Improvements in the manufacture of enamelled pipes, pipe couplings, and other articles or apparatus exposed to the action of gases or liquids." A communication. (Complete specification.) Dec. 31, 1874.

4487.—TRUSS, T. S., Eastbourne, "Improvements in the arrangement of force-pumps, and the combination and application of mechanical actions for working the same, to supply water or other fluids for the motive power of engines." Dec. 31, 1874.

4490.—ANDERSON, W., Southwark Street, London, "Improvements in centrifugal pumps." Dec. 31, 1874.

9.—FISH, W. S., Mystic, U.S.A., "A new or improved compound material applicable for packing stuffing-boxes of engines, pumps, and other mechanism, for packing joints of pipes, boilers, tanks, cylinders, and valve-chests, and others analogous thereto." Jan. 1, 1875.

25.—STRINGFELLOW, H. W., Folkestone, "Improvements in the manufacture of drain-pipes." Jan. 2, 1875.

46.—BONNEFOND, A., Paris, "An improved meter or apparatus for measuring water and other liquids." Jan. 5, 1875.

50.—DEACON, G. F., Liverpool, "Improvements in apparatus for measuring the flow of water in pipes." Jan. 5, 1875.

55.—DICK, A., Cannon Street, London, "An improved compressed air or gas spring and stuffing-box to be used in connexion therewith." A communication. Jan. 6, 1875.

66.—KIDD, J., Martin's Lane, London, "Improvements in the manufacture of gas for lighting and heating purposes, and in the apparatus connected therewith." Partly communicated. Jan. 7, 1875.

67.—BOYMAN, R. B., Clapham Park, Surrey, "Improvements in rotary engines moved by the expansive power of fluids, in the means of giving them such power, and in the machinery and application of the same." Jan. 7, 1875.

GRANTS OF PROVISIONAL PROTECTION.

4308.—CLARK, A. M., Chancery Lane, London, "Improvements in the manufacture or production of ammonia." A communication. Dec. 14, 1874.

4357.—GREEY, E. J., Halstead, Essex, "Improvements in mechanism applicable to the construction of gas, steam, or water engines and pumps." Dec. 17, 1874.

4365.—SPICE, R. P., Westminster, "Improvements in the manufacture of gas." Dec. 18, 1874.

4366.—HERRING, R., St. Helen's, Lancs, "Improvements in apparatus for securing the lids or covers of gas-retorts." Dec. 18, 1874.

4382.—ALLEN, S., Liverpool, "Improvements in and applicable to packing or rendering tight the spindles of valves." Dec. 19, 1874.

4386.—SPEIR, R., Greenock, N.B., and MATHER, J., Gateshead-on-Tyne, "New or improved apparatus, which may be used for condensing vapours or gases for heating liquids, for purifying and bleaching oils and gases, and for other analogous purposes." Dec. 21, 1874.

4387.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in the manufacture of hydrogen gases, and in the utilization of the bye or secondary products obtained in such manufacture." A communication. Dec. 21, 1874.

4403.—DAVIS, H. T., New Cross, "Improvements in the construction of traps for sinks, drains, and other conduits for water and other fluids." Dec. 22, 1874.

4404.—MUNFORD, A., South Petherton, Somerset, "Improvements in apparatus for lighting and extinguishing street and other lamps." Dec. 22, 1874.

4410.—KIRKWOOD, J. T., Yeo Vale, Devon, LASCELLES, C. T. E., New Cross, Kent, and HALL, J., Peckham, Surrey, "Improvements in the construction of gas-engines." Dec. 22, 1874.

4413.—POWELL, J. W., Bermondsey, London, "Improvements in apparatus for regulating and controlling the supply and flow of water and other liquids." Dec. 23, 1874.

4420.—WILLIS, H., and BLICK, J., Worcester, "Improvements in equilibrium slide-valves for steam-engines and engines worked by compressed air, gas, or water." Dec. 23, 1874.

4427.—MANN, W. T., Liverpool, "Improvements in or connected with hydraulic presses and pumps." A communication. Dec. 23, 1874.

INVENTIONS PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATIONS.

4466.—HASELTINE, G., Southampton Buildings, London, "Improvements in motive-power engines to be worked by steam, air, or other elastic fluid." A communication. Dec. 30, 1874.

4486.—HASELTINE, G., Southampton Buildings, London, "Improvements in the manufacture of enamelled pipes, pipe couplings, and other articles or apparatus exposed to the action of gases or liquids." A communication. Dec. 31, 1874.

NOTICES TO PROCEED.

2880.—HOUGHTON, J., Salford, "Improvements in the construction of taps or valves." Aug. 21, 1874.

2894.—HULETT, D., High Holborn, London, "Improvements in street and other lamps or lanterns, and in apparatus for regulating the supply of gas thereto and to other gas-burners." Aug. 24, 1874.

2915.—HILL, F. B., Lambeth Road, Southwark, "Improvements in connecting apparatus for coupling hose and other pipes, and securing covers on pipes and in other situations." Aug. 26, 1874.

2978.—JOHNSON, J., Lower Broughton, and ANDREW, E., Manchester, "Improvements in metallic packings for pistons, air-pump buckets, valves, and other purposes." Sept. 1, 1874.

2989.—FOSTER, J. K. J., Horbury, Yorks, "Improved apparatus for extinguishing fire, applicable also for distributing water for other purposes." Sept. 1, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2371.—WALKER, W., Newton Moor, Chester, "Improvements in direct-acting steam pumping-engines." July 7, 1874.

2404.—COOPER, H. E., Bethnal Green Road, London, "Improvements in the means of and in apparatus for carburetting air or gas for illuminating or heating purposes." July 8, 1874.

2409.—DIXON, F., Cliftonville, Brighton, "An improved method of and apparatus for disinfecting and deodorizing the injurious gases arising from sewers and drains." July 9, 1874.

2431.—Whitton, C., Leslie, N.B., "Improvements in stop-valves for steam and other pipes." July 11, 1874.
2434.—Warren, S. H., Crewe, and Wates, P. J., Greenwich, "Improvements in machinery and apparatus for charging and drawing retorts." July 11, 1874.
2439.—Schmersahl, A. E., Manchester, "Improvements in treating sewage water and other foul liquids for the purpose of purification, and in the manufacture of manure." July 11, 1874.
3717.—Chandor, J. A., New York, U.S.A., "Improvements in ignition fuses, and in the means for igniting the same, applicable to lamps, gas-burners, and other like purposes." A communication. Oct. 27, 1874.
3741.—Hollands, E. R., South Hornsey, and Cubitt, L. W., Islington, "Improvements in the construction of irons to be heated by gas." Oct. 29, 1874.
3838.—Martin, T., Guildford, "Improvements in lamps and apparatus for lighting the same." Nov. 6, 1874.
3910.—Mather, W., Salford, "Improvements in apparatus for measuring liquids for obtaining motive power, and for exhausting and forcing air and other gases and fluids." A communication. Nov. 12, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3447.—Clark, A. M., "Improved apparatus for the production of gas for lighting and heating purposes." Dec. 20, 1871.
3455.—Anderson, W., "Improvements in domestic apparatus for rendering sewage gases innocuous." Dec. 21, 1871.
3458.—Peters, S., and Peters, J., "Improvements in economic water-supply apparatus for water-closets." Dec. 21, 1871.
3483.—Brandon, D. H., "Improvements in the construction of water-meters and motors or engines." Dec. 23, 1871.
3503.—Newton, W. E., "Improvements in apparatus for generating gas." Dec. 28, 1871.
3504.—Ruck, W. D., "Improvements in the manufacture of gas." Dec. 28, 1871.
3517.—Calantariens, J. A., "Improved arrangements for preventing pipes or vessels containing water or liquid from bursting by the effects of frost or similar force suddenly brought into operation." Dec. 29, 1871.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

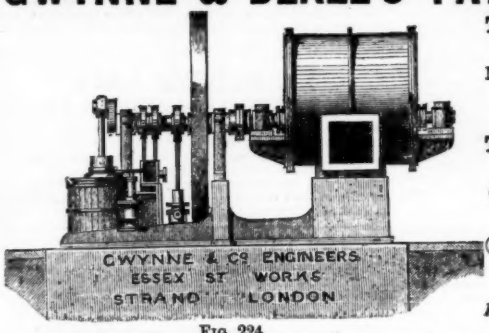


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

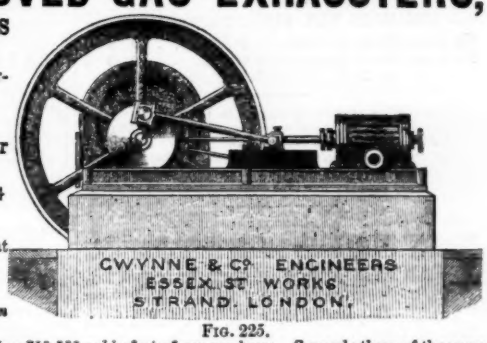


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

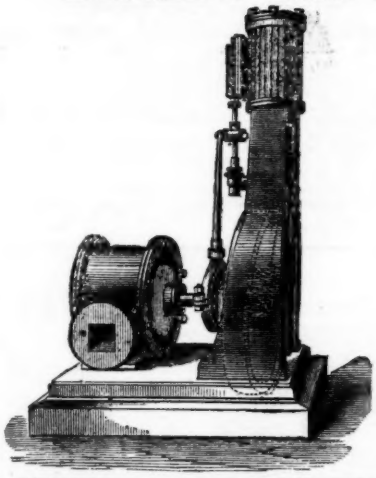
REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER

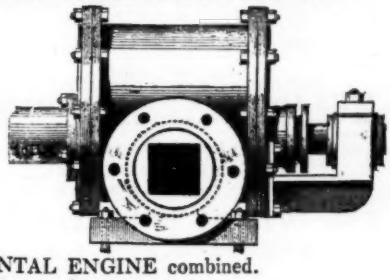


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



SOLE MAKERS,

GEORGE WALLER & CO.,

Who, since Mr. BEALE'S retirement, are the Oldest Makers.

EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, A.I.C.E.

The scope of this work is apparent from its title. The First Edition, published a year or two ago, was eagerly sought for, and has been now for some time out of print. The favourable reception accorded to it sufficiently proved that it supplied a generally acknowledged want in the profession. The work has undergone careful revision; much new matter has been added; and the New Edition is published in fcap. 8vo., morocco, gilt.

"This may be fairly described as among the most useful manuals of its class."—*Iron.*
"Gas managers will find it a very useful companion."—*Chemical News.*
"The new edition is published in a small octavo form, which makes it a handy book, either for the pocket or the desk."—Journal of Gas Lighting.
"An excellent little book."—*Mr. R. H. Patterson (late Gas Referee) in the* Journal of Gas Lighting, *April* 28, 1874.

Orders to be sent to the Publisher,

WILLIAM B. KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C

IN CHANCERY.

In the Matter of the Companies Acts 1862 and 1867, and in the Matter of the Foreign and Colonial Gas Company, Limited.

THE Creditors, resident within the United Kingdom, of the above-named Company, are required, on or before the 1st day of February, 1875 to send their Names and Addresses, and the particulars of their Debts or Claims, and the Names and Addresses of their Solicitors (if any), to Robert Fletcher, of No. 2, Moorgate Street, in the City of London, public accountant, the official liquidator of the said Company, and if so required by notice, in writing, from the said official liquidator, are, by their Solicitors, to come in and prove their said Debts or Claims at the Chambers of the Vice Chancellor Sir Richard Malins, at No. 3, Stone Buildings, Lincoln's Inn, in the county of Middlesex, at such time as shall be specified in such notice, or in default thereof they will be excluded from the benefit of any distribution made before such debts are proved.

Tuesday, the 16th day of February, 1875, at Twelve o'clock at noon, at the said Chambers, is appointed for hearing and adjudicating upon the Debts and Claims.

Dated this 23rd day of December, 1874.

Alfred Rawlinson, Chief Clerk.

Wilkins and Blyth, 10, St. Swithin's Lane London, Solicitors for the said Official Liquidator.

Will shortly be ready, price 18s., bound in cloth, lettered,

THE TWENTY-FOURTH VOLUME

(JULY TO DECEMBER, 1874)

OF THE

JOURNAL OF GAS LIGHTING, WATER SUPPLY, AND SANITARY IMPROVEMENT.

CLOTH CASES, GILT LETTERED,

For binding Vol. XXIV., may now be obtained, Price 2s. 6d.

TERMS OF SUBSCRIPTION.

The JOURNAL OF GAS LIGHTING is supplied direct from the Office to residents, in any part of the United Kingdom, at the rate of 21s. per annum, payable in advance. If credit be taken, the charge is 25s.

Halfpenny stamps may be forwarded for amounts under 5s. Any larger sum should be remitted by Money Order, payable at the General Post Office, to William B. King.

CHARGES FOR ADVERTISEMENTS.

Six lines (about 40 words) or under . . . £0 3 0
Each additional line (about 8 words) . . 0 0 6

Special Terms for Continuous Advertisers.

The insertion of Advertisements in the current week's issue cannot be guaranteed unless received at the Office by THREE o'clock p.m. on MONDAY.

The Publisher cannot be responsible for Testimonials, accompanying replies to Advertisements, left at the Office and strongly recommends that *copies only* should be sent.

LONDON:

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, by the Advertiser, aged 28, a situation as METER-FIXER, Fitter, Service-Layer, &c.

Address R. M., care of Mr. Smith, 60, Cornwall Road, Lambeth, LONDON.

WANTED, at a Gas-Work, a competent Man as GAS-FITTER and Main and Service Layer. One who can do ordinary smith's work preferred.

Address No. 121, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FITTERS.

WANTED, by the Colchester Gas Company, an efficient Man as FITTER and Meter Inspector, who also understands main and service laying, &c. Sobriety indispensable. Wages 26s. per week.

Application, by letter only, stating age, &c., to be sent to JOHN T. BROWNING, Manager.

ENGINEMAN Wanted, by the Cambridge University and Town Water-Works Company. Must be able to execute ordinary repairs to the engines and pumps. Wages 39s. per week, with house (free of rates and taxes), coals, and garden.

Applications to be made, not later than the 27th inst., to HENRY TOMLISON, Engineer, 4, Bene't Street, CAMBRIDGE.

COKE, COKE, COKE.

IMPORTANT TO GAS COMPANIES.

THE Advertiser is prepared to take any quantity of good GAS COKE loaded into his trucks at nearest station.

Address, stating price and quantity, to J. HORTON, Castleford Iron-Works, Castleford, YORKSHIRE.

ADVANTAGES OF GAS FOR COOKING AND HEATING,

BY

MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their gas consumers.

Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

FOR SALE.

THE Directors of The Gaslight and Coke Company have FOR SALE, at their Blackfriars and Goswell Street Stations several GASHOLDERS, the diameters of which range from 40 ft. to 100 ft.

Further information can be obtained on application to Mr. Robert Harris, Gas-Works, Bow Common, E.

By order,

JOHN ORWELL PHILLIPS, Secretary.

Chief Office, Horseferry, Road, Westminster, S.W., Dec. 24, 1874.

PROPOSALS will be received by the Magistrate of the City of Vienna (Austria), up to the 16th of January, 1875, for PROVIDING the CITY of VIENNA with GAS, from the 1st of November, 1877, for a period to be agreed upon, with the obligation to erect Gas-Works and to lay the conduit-pipes, the city reserving the right to take possession of the whole after a specified time.

Plans and specifications for the Gas-Works, and everything appertaining thereto, are obtainable at the Office of the MAGISTRATE.

BOROUGH OF ROTHERHAM.

GAS-WORKS.

THE Corporation of Rotherham are prepared to receive TENDERS for the supply of 504 ft. run of Fire-Clay Oval RETORTS, 21 by 15 by 2½ in. thick; 3150 FIRE-BRICKS, and six tons of fine ground FIRE-CLAY. The above to be of the best quality.

For drawings and specifications apply to Mr. Goodwin, Gas Manager, Rotherham.

The Corporation do not bind themselves to accept the lowest or any tender.

Tenders to be sent to me on or before Tuesday, the 26th of January, 1875.

By order

W. WHITFIELD, Town-Clerk.

GAS TAR AND LIQUOR.

THE Directors of the Gravesend and Milton Gaslight Company are prepared to receive TENDERS for the purchase of their surplus TAR and AMMONIACAL LIQUOR for Three years, from the 25th of March next.

The quantity of Tar is estimated at about 40,000 gallons and the Liquor at about 60,000 gallons per annum.

The Company will load into the Contractor's barges.

The average strength of the Liquor is about 11 ounces, but no strength will be guaranteed.

Further particulars may be obtained on application to the Superintendent at the works, Canal, Gravesend.

Tenders, marked "Tar, &c.," to be sent to my Office, King Street, Gravesend, on or before the 3rd day of February next.

TUFNELL SOUTHGATE, Secretary.

Gravesend, Jan. 9, 1875.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.

South Shields. W. J. WARNER.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET,

DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street E.C.

GARSIDE'S IMPROVED REGISTERED TUBE-VICE, holds all sizes of Wrought-Iron and Brass Tubes, from a 2-in. socket to the smallest brass tube made.

GARSIDES IMPROVED MAIN DRILLING CLIP, made in two sizes, to drill from 2-in. to 6-in. Mains, and from 6-in. to 12-in. Mains.

The above tools are made light and handy.

For drawings, &c., apply to the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

SULPHATE OF AMMONIA.

MR. H. HATHAWAY begs to call the attention of Gas Companies, Local Authorities, and others, to his improved apparatus for the MANUFACTURE of SULPHATE of AMMONIA, without occasioning the slightest nuisance, which has been adopted successfully by several large Gas Companies. References given.

For terms and other particulars apply to H. HATHAWAY, 28, Linskill Terrace, NORTH SHIELDS.

Mr. NORWOOD EARLE,

GAS SURVEYOR,

12, QUEEN VICTORIA STREET, E.C.,

Advises on all matters connected with the Distribution of Gas, Public Lighting, Gas Testing, &c.

Valuations made for Assessement and other Purposes.

Mr. HENRY GORE,

CONSULTING GAS ENGINEER,

9, ISLIP STREET, KENTISH TOWN, LONDON, N.W.,

May be consulted on all matters relating to the Manufacture or Distribution of Gas, including Inspection and Reports on Works, Foreign Concessions, Patented or other Processes.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

WM. RICHARDS,

INVENTOR OF THE DRY GAS-METER,

REVISER OF "HUGHES ON GAS-WORKS,"

CONSULTING GAS ENGINEER,

Advises on all matters of business connected with Gas lighting. Furnishes Working Drawings of Retort-Settings, pecification of Works, complete or in detail.

17, BURTON ROAD, BRIXTON, LONDON, S.W.

GAS COMPANIES ACCOUNTS.

EDWARD SANDELL,

PUBLIC ACCOUNTANT,

The Projector of the Gas Companies Analyzed Expenditure Account Book, having had twenty years experience in opening, keeping, auditing, and investigating Gas Companies Accounts, offers his services for similar purposes, and also in preparing Financial and Statistical Accounts for Arbitrations or Parliamentary Applications. References to numerous Gas Companies and the most eminent Consulting Gas Engineers.

4, Skinner's Place, Queen Victoria Street, LONDON.

TO INVENTORS AND PATENTEES.

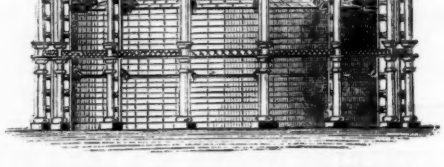
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years,

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 49, Parliament Street, WESTMINSTER.

HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

TO GAS COMPANIES AND THE TRADE.

J. DEFRIES & SONS,

MANUFACTURERS OF

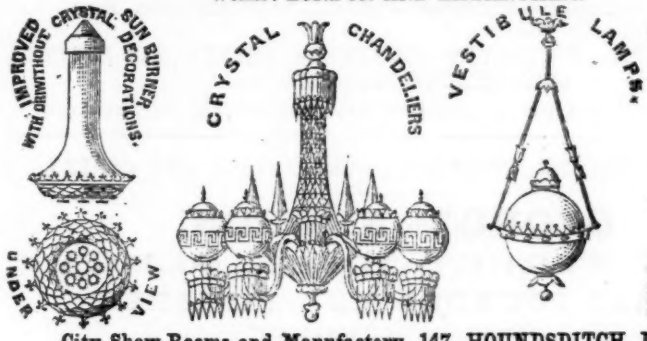
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.

A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.

THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.

STREET LAMPS AND COLUMNS IN GREAT VARIETY.

WORKS: LONDON AND BIRMINGHAM.



GAS MOONS,
Cut and Engraved, of the newest designs

GAS REFLECTORS
In Silver and Glass

GAS NIBS
AND
BURNERS
Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices

---

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¼ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

PATENT FUEL AND LIME FOR PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD
CITY ROAD, LONDON, N.,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

C. & W. WALKER,

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE,
MANUFACTURERS OF
TELESCOPIC AND SINGLE-LIFT
GASHOLDERS,
CAST & WROUGHT IRON GASHOLDER-TANKS,
CONDENSERS, SCRUBBERS, & PURIFIERS.

LONDON: 8, FINSBURY CIRCUS, E.C.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

Crystal Palace District Gas Company, Lower Sydenham, S.E.

To Messrs. John Wright and Co., Essex Works, Birmingham.

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.

No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,
Has all the appearance of a Bright Fire.
PRICE from 32s

OXIDE OF IRON.—We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
FRANCIS RITCHIE & SONS,
BELFAST.

PRICE'S PATENT COKE & COAL BARROW.

effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

BELGIAN CLAY RETORTS.
J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.
WILLIAM FRASER,
INVERKEITHING,
Owner of the Works at which Fire-Clay Retorts were first made), can supply
RETORTS, FIRE-BRICKS, &c.,
to any extent.
References can be given to managers of above a hundred Gas-Works whom he supplies.
He ships at Charlestown his
CELEBRATED HALBEATH STEAM COALS,
on Navy List.

JAMES NEWTON & SONS.
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

PLUTONIC CEMENT,
For REPAIRING RETORTS while in ACTION, &c.
SOLE MANUFACTURER,
WILLIAM RICHARDSON,
GAS AND HYDRAULIC ENGINEER,
93 & 94, CHARLES HENRY ST., BIRMINGHAM.

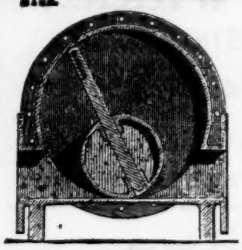
INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

TO GAS COMPANIES, ENGINEERS, &c.
WOOD SIEVES.—WOOD SIEVES.
Estimates given and Contracts taken by the Manufacturer
GEORGE MACKANESS,
36, EDWARD STREET, HAMPSTEAD ROAD,
LONDON, N.W.
These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.
N.B.—Specimens sent free on application.

B. CARPENTER,
THE ORIGINAL MANUFACTURER OF
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
WORKS:
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

MOBBERLEY & PERRY,
THE HURST
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, & TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TRADE MARK
J. BEALE'S
PATENT
GAS EXHAUSTER.

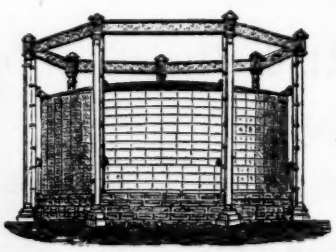


BEALE'S CONTINUOUSLY ACTING
GAS EXHAUSTERS
ARE NOW MANUFACTURED BY
B. DONKIN & CO.
MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.
B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.
Estimates and Prices on application to
B. DONKIN & CO.,
ENGINEERS & IRONFOUNDERS,
BERMONDSEY, LONDON, S.E.

JAMES MILNE & SON,
GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
NEWGATE STREET, LONDON.
Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.
STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

TO GAS COMPANIES, ENGINEERS, CONTRACTORS, AND OTHERS.
GEORGE NEWTON,
UNION STREET WEST, OLDHAM,
BRASS FOUNDER AND FINISHER,
MANUFACTURER OF
IMPROVED WET AND DRY CONSUMERS GAS-METERS,
LAMP METERS AND BOXES,
GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,
GAS STATION-METERS,
With all the joints planed.
TERMS, &c., ON APPLICATION.

SAM. CUTLER & SONS,
CONTRACTING GAS ENGINEERS,
GASHOLDER & GENERAL GAS APPARATUS MAKERS,
MANUFACTURERS OF
BOILERS, IRON ROOFING, IRON BRIDGES,
AND GENERAL IRONWORK.



S. C. AND SONS undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works**, for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs**, and every description of **Apparatus** for the Manufacture and Distribution of Gas.
Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers**, and **Purifiers**, of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**
WORKS FOR THE SUPPLY OF
VILLAGES, MANSIONS, FACTORIES, &c.

S. C. AND SONS undertake the **Supply** and **Laying** of **Mains** for **Gas and Water**, and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of these goods most in request.
SOLE MAKERS OF BRETT'S PATENT COKE BARROW.
Experienced Retort Setters sent to any part of the Kingdom.
Address: **PROVIDENCE IRON-WORKS, MILLWALL, LONDON.**

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

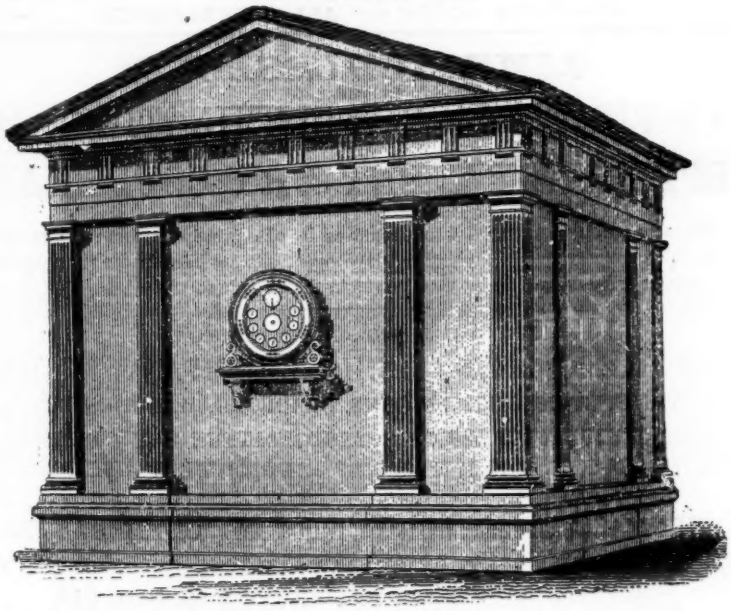
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

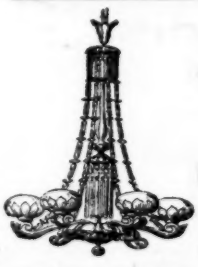
GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of **CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.**

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

4, CANNON ROW, PARLIAMENT STREET, S.W.

MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the forezoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains [illegible]trations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

ADDISON POTTER,

WILLINGTON QUAY,

NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of

CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS,

&c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

NEAR

BLAYDON-ON-TYNE.

THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

SHORT STREET, LAMBETH, LONDON.

J. & H. ROBUS,

(Late of the Crystal Palace District Gas-Works, Sydenham, and the New City Gas-Works, Montreal, Canada,)

GENERAL CONTRACTORS & RETORT-SETTERS, FITTERS & MAIN-LAYERS.

RETORTS SET ON THE LATEST IMPROVED PLAN.

Retort-Setters sent to all parts of Europe and America.

Address, J. and H. ROBUS,

BELL GREEN, CATFORD, KENT.

EMILY GIBBONS,

Dibdale Fire-Clay Works & Colliery,

Near STOURBRIDGE.

(ESTABLISHED 1834.)

MANUFACTURER OF EVERY DESCRIPTION OF

Burs, Lumps, Stays, Shields, Blast Furnace and other Bricks & GAS-RETORTS.

Red and Blue Clay Goods, Engineering and other Ironwork, and Fittings supplied.

N.B.—Above works having been recently enlarged, orders of any magnitude for HOME or EXPORT Trade will receive immediate attention.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for twelve years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

8, FINSBURY CIRCUS, LONDON.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

CLOTH GAS-BAGS FOR MAINS.

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers and Steam Joints.

T. BUGDEN, Manufacturer,

79, GOSWELL ROAD, LONDON, E.C.

THE PATENT

CATOPTRIC LAMP

Is now in use in Moorgate Street, Cheapside and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
173, ST. VINCENT STREET, GLASGOW.

RUSSEL'S BOGHEAD.

MUIRKIRK, No. 1, CANNEL
Yields 11,600 cubic feet of 34·3-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

MUIRKIRK, No. 2, CANNEL
Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

OLD WEMYSS CANNEL
Yields 12,550 cubic feet of 33-candle gas per ton.
Prices and full Analyses on application.

GAS COAL
Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.
Contracts undertaken for the Shipment, Insurance, and Delivery Abroad of Plant and Materials for Gas and Water Works, &c.
THOMAS BROCKELBANK & CO.,
Coal Exporters and Ship and Insurance Brokers,
115, LEADENHALL ST., LONDON.

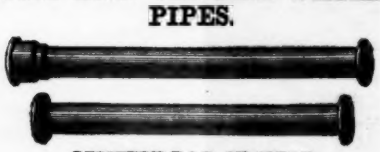
POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

THE EARL OF HUME'S
LESMAHAGOW
MAIN SEAM CANNEL COAL.
CRAIGNETHAN GAS COAL CO.,
LESMAHAGOW, N.B.
Analysis and Price on Application.

LEE and JERDEIN,
COAL OWNERS & MERCHANTS.
Chief Office:
9, LANCASTER PLACE, STRAND, LONDON, W.C.
SOLE VENDORS FOR
LONDON & THE SOUTHERN COUNTIES
OF
WIGAN COAL AND CANNEL,
From the Mines of the
INCE HALL COAL & CANNEL COMPANY, Limited,
AND
Messrs. W. H. BRANCKER & Co.

THOMAS READ & CO.,
BRAZILIAN IRON-WORKS,
MALTON, YORKS,
MANUFACTURERS OF
GAS and WATER PIPES,
Bends, Tees, and Irregulars,
AND
GENERAL FOUNDERS.
ESTIMATES and PRICES on APPLICATION.

GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.
CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B. ON CLYDE.
Prices on application.

EASTWOOD & CO.,
LIMITED,
Wellington Wharf, Belvedere Road, Lambeth,
AND
Canal Bridge Wharves, Old Kent Road, S.E.
LIME, CEMENT, AND BRICK MANUFACTURERS
AND MERCHANTS.
SHOEBURY AND KENT STOCKS, AND SUFFOLK RED AND WHITE BRICKS DELIVERED IN ANY QUANTITIES, OR BY BARGE ALONGSIDE.

Stourbridge, Newcastle, and Welsh FIRE-BRICKS and LUMPS of all descriptions.	Malam and Moulded Bricks, PORTLAND CEMENT (made from the Medway Earth, &c.) of UNSURPASSED quality.	Grey Stone Lime, FLARE LIME Chalk Lime, Blue Lias, Roman and other Cements.

ALSO
BUILDING GOODS OF ALL DESCRIPTIONS.

LIME SUPERSEDED
IN THE
PURIFICATION OF ILLUMINATING GAS
BY
SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION TO
SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER;
SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS, SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;
MANUFACTURERS OF
SULPHATE OF AMMONIA, VITRIOL, COPPERAS, &c.;
PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

D. BRUCE PEEBLES & CO.'S
PATENT
LAMP REGULATOR

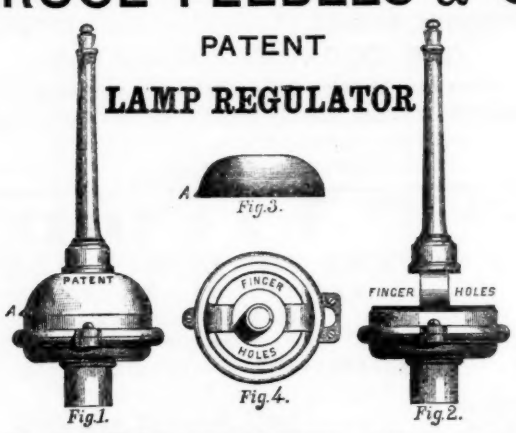


Fig.1. *Fig.3.* *Fig.4.* *Fig.2.*

D. BRUCE PEEBLES AND CO.,
ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,
PATENTEES OF
GAS REGULATORS FOR PUBLIC LAMPS, FACTORIES, PUBLIC HALLS, AND DWELLING-HOUSES.

Attention is respectfully requested to the following extract from a lecture "On the Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow, by Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner for the city of Glasgow, on the 4th of March last:—
"A few years ago, a simple form of Gas Regulator for Street Lamps was introduced, I do not knew by whom, and various forms of it, and improvements on it, have been made by many practical gas engineers. Of all the modifications of the instrument, the best in my opinion is that of Mr. D. Bruce Peebles, of Edinburgh; in fact, his Lamp Regulators are so superior that they are likely to supplant all others. Already about 9000 of these have been applied to the street-lamps in Glasgow, and I understand it is the intention of the authorities to introduce them all over the town. The saving thereby effected I calculate to be about £6000 per annum, without any diminution of light. One of the great advantages of Mr. Peebles's apparatus over all others is that it can be regulated while the gas is burning."
Since the above date, another 1000 have been supplied to Glasgow, and they are being largely adopted at home and abroad.

D. B. P. and Co. are prepared to Estimate for the Supply and Maintenance of their Regulators, and will be glad to forward terms on application.

D. BRUCE PEEBLES AND CO.,
ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,
FOUNTAINBRIDGE WORKS, EDINBURGH.

G. J. EVESON,
GAS COAL MERCHANT,
STOURBRIDGE.

Delivery per Rail to any Part.

THE WIGAN COAL AND IRON COMPANY,
LIMITED,
COLLIERY PROPRIETORS,
(HEAD OFFICES: WIGAN, LANCASHIRE;
DISTRICT OFFICE:
18, BENNETT'S HILL, NEW STREET, BIRMINGHAM,)
Supply the Best Wigan Arley Mine Gas Coal & Nuts,
THE BEST HAND-PICKED ROUND CANNEL,
ALSO SMALL OR GAS CANNEL, &c., &c.

GEORGE ORME & CO.,
GAS METER MANUFACTURERS, BRASSFOUNDERS & FINISHERS,
ATLAS METER-WORKS, OLDHAM.

CONSUMERS WET & DRY GAS-METERS ON THE MOST APPROVED PRINCIPLES.
STATION-METERS, GOVERNORS, PRESSURE-REGISTERS,
And every Description of Gas Apparatus.
GAS, STEAM, AND WATER FITTINGS.

CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

THE
HUCKNALL COLLIERY COMPANY
Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.
Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

SCOTCH CANNEL COALS.
The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.
JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET, EDINBURGH.
Established 1840.

WYLAM WOOD COAL COMPANY,
LIMITED,
WYLAM-ON-TYNE.
WYLAM WOOD CANNEL COAL WORKED FROM ABOVE COLLIERY.
Analysis—10,280 cubic feet of gas per ton of Coal, having an Illuminating Power of 26·2 Sperm Candles, and yields 13¼ cwt of Coke per ton of Coal.
PORTS OF SHIPMENT:
TYNE DOCK AND NORTH DOCK, SUNDERLAND.
For prices and further particulars, apply to
UTRICK ALEXANDER RITSON,
6, QUEEN STREET,
NEWCASTLE-ON-TYNE.

Established

1795.

JOSEPH CLIFF & SON,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
MANUFACTURERS OF ALL DESCRIPTIONS OF
FIRE GOODS, and Salt-Glazed Drain-Pipes.
LONDON WHARF:
Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;
LIVERPOOL—1, Back Leeds Street,
Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.
Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—
(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.
These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.
APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853;
PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS.
LONDON, 1862;
DUBLIN, 1865;
PARIS, 1867.

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS

Of the highest excellence.

STATION-METERS AND GOVERNORS.

STREET-LAMP REGULATORS.

TESTING APPARATUS

Of the most perfect description for all purposes relating to Gas.

55 and 55A, MILLBANK STREET, WESTMINSTER, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND **GLASGOW.**

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE: 106, CANNON STREET, E.C.

HARRIS & PEARSON,

FIRE-CLAY AND BRICK WORKS, STOURBRIDGE,

PROPRIETORS OF

BEST GLASS-HOUSE POT AND CRUCIBLE CLAY,

AND MANUFACTURERS OF

CRUCIBLES, GLASS-HOUSE FURNACE BRICKS, BLAST-FURNACE BRICKS,

GAS-RETORTS, LUMPS, TILES, & FIRE-BRICKS,

OF EVERY DESCRIPTION.

N.B.—All sizes and shapes of Bricks, Lumps, and Tiles, used for Glass, Iron, Gas, Copper, Cement, and other works, kept regularly in stock. Any particular Size or Shape required made to order on the shortest notice.

A LARGE ASSORTMENT OF GAS-RETORTS IN STOCK.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, January 12, 1875.